

# 2005 COAL MINE RESCUE, FIRST AID, BENCH AND PRESHIFT RULES



***SECTION I***

***MINE RESCUE***

**2005 MINE RESCUE CONTEST RULES  
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## GENERAL INFORMATION FOR CONDUCTING 2005 MINE RESCUE CONTESTS

1. Mine rescue teams must be composed of persons who are bonafide employees of mining companies or persons who are designated or contracted by mining companies to fulfill the requirements of 30 CFR Part 49 mine rescue coverage.
2. All mine rescue teams must report to isolation at 6:30 a.m. on each day of their participation. The number of persons in isolation will be limited to eight uniformed team members.
3. Teams are required to bring with them a sufficient supply of materials and apparatus accessories.

Teams cannot expect recharging materials and facilities, apparatus parts, and accessories for the several types of apparatus to be made available at the contest site.

4. In mine rescue ties, B cards will be the first tie breaker; mine maps will be the second tie breaker; written examinations will be the third tie breaker; time cards will be the fourth tie breaker; and actual time to work the problem(s) will be the fifth tie breaker.
5. Mine rescue teams shall be notified by posting when they may review their map and scorecards. Within one hour of posting, the team captain, team trainer, and map man shall report to a designated location. Teams will have 20 minutes to review and prepare any written protests. All protests will be considered by the Final Appeals Committee. Under no circumstance will video tape recordings or photographs be introduced as supplementary material for consideration by the Final Appeals Committee.
6. For a combination team, the three working first aid team members will be chosen from the registered mine rescue team members.

The final ranking of combination teams will be determined from a composite of both days mine rescue scores and the first aid team's scores. In the event a team enters more than one first aid team, the first aid team's lowest score will be used to determine the final ranking. In the event of ties in the Combination Contest, the final Mine Rescue ranking will be the tie breaker.

## **RULES GOVERNING 2005 MINE RESCUE CONTESTS**

1. Each team shall be composed of a minimum of seven persons (five working team members, a briefing officer, and a patient) and shall be limited to a maximum of eight persons. In the event of an emergency, the Contest Director may exempt a team from the seven person minimum, and allow only the replacement of a patient. Each member shall wear a different number, from one to eight, on the arm, at or near the shoulder, with No. 1 assigned to the captain. Any means of affixing legible numbers on the sleeve of the uniform will be acceptable. After the clock is started only the five working members and the briefing officer will be permitted to do work.

Each team shall have a briefing officer. The briefing officer will accompany only one participating team and may assist that team with any of the functions normally performed on the surface or at the fresh-air base. Switching of team members including the briefing officer from one team to another is prohibited. The briefing officer will be stationed at the fresh-air base during the working of the problem and will be permitted to communicate with the team via telephone and may mark the briefing officer's map from information received from the team. The briefing officer's map will be identified by the Chief Judge and shall not be used for scoring purposes. All maps shall be turned in at the completion of the problem.

The briefing officer will remain at a designated location when the team is working in by the fresh-air base except when it is necessary to perform work outside that location in the fresh-air base. When required work is completed, the briefing officer must return to the designated location. Briefing officers meeting the physical requirements may substitute for any team member if so desired.

2. Each team shall provide its own breathing apparatus for each member of the team. A breathing apparatus approved for at least two hours shall be used in mine rescue contest problems. Other approved breathing apparatus may be used on patients. Each team member must wear safety boots, an MSHA approved protective hat and cap lamp, and members must be similarly dressed. During the working of the problem, the cap lamps may or may not be turned on. The wearing of self-rescuers is not required for Contest work. Each team member must have a metal identification tag attached to his/her belt.
3. Each team must have its own breathing apparatus approved under either Bureau of Mines Schedule 13 or Subpart H of Part 11, Title 30, Code of Federal

Regulations. Any team that anticipates using a breathing apparatus not listed in the rules must provide, at the time of registration, written instructions outlining the proper donning procedures for such apparatus.

4. Gas testing devices used by teams shall be approved by MSHA, and only instruments which give an accurate reading for percent by volume or parts per million shall be used. Any team that anticipates using an instrument not listed in the rules shall provide, at the time of registration, written instructions outlining the proper procedures for checking and testing with such instruments.
5. Teams must assure themselves that before they report to the mine entrance or fresh-air base all apparatus are fully assembled, airtight, and ready to wear. Cylinder pressures must be within specifications of approval. Spare apparatus are not required to be tested as part of the equipment check at the fresh-air base. Full practice canisters or other acceptable canisters must be in place in the apparatus. Each team will be responsible for the proper removal of all waste material from the Fairground property (i.e. canisters or chemicals).
6. Teams shall be equipped with and use a portable mine rescue communications system approved by MSHA or a sound powered communication system. The wires or cable shall be of sufficient tensile strength to be used as a manual communication system. Teams may use standard signals if the communication system fails. Wireless communication systems may be used, provided they are designed and used in such a manner that the integrity of the Contest is not jeopardized, as determined by the Contest Director. Anyone anticipating using wireless communication shall notify the Contest Director by August 1, 2005. Wireless communication systems will be prohibited in the isolation area. This includes personal pagers, cellular phones, radios, laptop computers, etc.
7. Each team must be under guard, in a designated location, before the start of the Contest. Teams must remain continuously under guard until time to work the problem. Teams that have performed will not be permitted to return to the isolation area or communicate with any teams awaiting their turn to perform.
8. Any team or member receiving information concerning a Contest problem prior to arriving at the fresh-air base will be disqualified by the Chief Judge and Director.

Any team or member receiving unauthorized information concerning a Contest problem after arriving at the fresh-air base may be disqualified by the Chief Judge and Director or discounted under Rule 38.

9. Teams will not be permitted to furnish or make placards indicating materials or equipment and then simulate their use.

### **WRITTEN EXAMINATION**

1. During isolation, contest officials will select one team member from the five working team members and the briefing officer to take the written examination. One number will be drawn which will apply to all teams. The written examination will be ten statements of fact taken verbatim from the contest rules which will be fill in the blank and each blank space shall represent a key word with no more than one blank per statement.

A maximum of fifteen minutes will be allowed for the team member to take the test.

2. Team members taking the written examination will not be permitted to take any written material or information into the testing area.
3. There will be no discussion during the time that written examinations are being taken.

### **FRESH-AIR BASE PROCEDURES**

1. The person in charge of the fresh-air base will introduce himself/herself to the team captain and briefing officer upon arrival of the team at the mine portal or fresh-air base. Teams will be allowed to position (this means unloading stretcher) their equipment and lay out lifeline across the fresh-air base prior to the introduction. The person in charge of the fresh-air base will read and present a prepared statement to the team but will not answer questions regarding the problem or conditions in the mine. The prepared statement will include information relating to the mine or section of the mine to be explored. A maximum of five minutes will be allowed for discussion and preparation after the team receives the written statement. The team will be confined to the fresh-air base during this time period. A video presentation may be used in lieu of reading a prepared statement.

2. Each team will be given a written problem and maps. The timing clock will be started by the team captain immediately after the team receives the blank map and problem. Time required for studying the problems, checking equipment and getting under oxygen and/or air will be included in the total problem working time.

### MISCELLANEOUS

1. To rescue people, teams may be required to change existing ventilation, energize power circuits, pump water, or support unsafe roof if it can be done safely. Other methods of recovery will not be accepted (i.e. roping, hooking, etc.).
2. Only judges, Contest officials, news media, and working team members will be permitted in the working areas. Unauthorized persons must stay out of the working area. Photographers who wish to take pictures of the working teams must receive permission from the Director of the Contest.
3. Solid lines on a map denote actual and accurately measured workings. A solid line means there will be no openings from above, below or on the same plane that are not shown on the map.

Dotted lines, on a map, denote projections and may or may not be accurate.

### INTERPRETATIONS OF A CARDS

1. For each incorrect answer on written examination. \_\_\_\_1
2. Failure to examine gauges and apparatus at not more than 20 minute intervals. This must be done at a team stop. One point for each minute or fraction thereof. (Total discounts are not to exceed 5 points)\_\_\_\_1

The zero point for the timekeeping process for apparatus checks will begin with the completion of the last person checked during the first apparatus examination and this will be the procedure that will be used throughout the problem. This means that all team members must be checked before the next twenty minutes have elapsed.



3. Failure to complete the problem in the calculated time, for each three minutes overtime, or fraction thereof (not to exceed 10 points)\_\_\_1

The calculated time will be determined by averaging the working time of all teams participating in the Contest.

The working time for a problem will start when the team captain starts the recording timing device at the fresh-air base and will continue until the team captain stops the timing device. The team captain must start the timing device immediately after receiving the maps and problem and before any work is done.

In the event the captain fails to start or stop the timing device, working time will be determined by the timekeeper and the team will be discounted under Rule 26 (B Card). When the captain stops the timing device, the maps must be submitted to the judges. (No work will be permitted on the map after the timing device has been stopped.)

4. When submitted to the map examiners, conditions and/or objects marked on the map in any area of the mine not explored by the team, each infraction\_\_\_1

Conditions and/or objects that are in advance of the point that the captain has traveled shall not be recorded on the map, except for the following conditions when they extend from rib to rib: unsafe roof, caved areas, and water over knee deep. This also includes inextinguishable fires. The captain will examine these areas as close as practical, and this will require them to be located on the mine map.

Objects or conditions passed by the team in the same opening or intersection shall be marked on the map.

5. Failure to locate and record accurately (verbatim) on the map objects/conditions that should have been found and were indicated to be in the mine, for each omission \_\_\_2

Verbatim means that the card information only has to be in sequence not stacked or oriented like the card.

The team is not responsible for locating and mapping objects/conditions that are initially found in the fresh-air base.

This discount shall be assessed for all objects/conditions that are not mapped in an area of the mine that the team should have explored if the problem had been

worked systematically and correctly or for mapping objects/conditions not found in the mine.

Objects/conditions located in areas of elongated unsafe roof, unsafe rib, and areas where unsafe roof extends diagonally from rib to rib must be mapped if passed by the team.

The legend developed by MSHA and furnished to the teams shall be used by all teams to mark their respective mine maps. Objects/conditions not covered by the legend will be written in by the team and the location of the object/condition indicated by the symbol "X". The team may place any additional information on the mine map concerning objects/conditions found in the mine if it does not adversely affect the legibility of the items/conditions required to be mapped.

The marked map as submitted by the team will be compared with the problem and key map by the map examiners. Objects/conditions located on the map must be within six feet of accuracy and the six foot allowance will be measured from the center point of the object/condition drawn in to the center point of the object/condition denoted on the key map. All objects/conditions mapped by the team must be shown in the entries, crosscuts and openings. If a team fails to explore the entire mine, the farthest point of advance shall be indicated on the map submitted to the map examiners except at locations where the following objects/conditions are encountered: faces, caved areas, water over knee deep, unsafe roof across an opening, seals, stoppings, barricades, closed regulators, and inextinguishable fires. Objects/conditions must be indicated on the team's map submitted to the map examiners. This does not include statements read by the patient or notes given to the team.

Information found on notes in lunch boxes, at barricades and any other location must be recorded on the mine map. The map shall reflect an X for each note found. (e.g. one X for the lunch box and one for the note.) These X's cannot be stacked one on top of the other.

Additional information placed on the map by the team cannot be existing symbols that are presently denoted in the legend, regardless of color coding used by the team in mapping.

The six foot tolerance will not apply to pillar blocks drawn in projected areas, but discounts will be assessed for improperly located objects/conditions in these areas including faces denoted by placards.

A placard indicating person that is located by the team in an area of elongated unsafe roof, but cannot be reached due to a lack of roof support, shall be mapped as an X with the word person written out. If the team subsequently reaches the person placard and the placard is changed to a body or live person, the proper symbol shall be used in conjunction with the original X.

The following changes need to be noted on the mine map to indicate the conditions left in the mine and the fresh-air base: changes to ventilation structures (i.e. stoppings, doors, regulators, etc.); victims removed from the mine; electrical circuits energized or de-energized; fires extinguished; water pumped; roof supports installed; and in the areas reentered by team, smoke cleared, gases removed, and permanent changes in direction of ventilation. Any terminology which describes these changes is acceptable.

Ventilation structures such as stoppings, doors, etc. that are initially located and mapped, will remain on the map and any removal of such structure will be reflected by a notation such as removed. If rebuilt, a notation, such as rebuilt, will suffice. If a check curtain is converted to a temporary stopping, a notation indicating such will suffice.

All newly erected, intact and airtight structures built by the team, except for frames erected for a line curtain, will be considered to be temporary stoppings. Regardless of their use or intention (i.e. ventilation, airlock, seals, etc.) they shall be treated and mapped as a temporary stopping.

### INTERPRETATIONS OF B CARD

#### A. Apparatus

1. Apparatus improperly assembled, each apparatus\_\_\_ 3

Failure to fasten covers, snaps, etc.

Full practice canisters or other acceptable canisters must be in place and used in the apparatus.

2. Apparatus improperly adjusted to the wearer, each person\_\_\_1

If required, patient must have apparatus on and properly adjusted, even if on stretcher.

This ONLY applies to shoulder straps, chest straps, and head straps that are not properly fastened, are twisted or rolled (separate discount for each strap).

3. Failure to follow prescribed procedures for going under oxygen, each person, excluding patient\_\_\_3

This will depend on type of apparatus used.

4. Apparatus part or parts worn or deteriorated so as to be dangerous to the wearer, each person\_\_\_8

Holes that are in the breathing tubes and straps that break after the wearer goes in by the fresh-air base are discounts.

5. Oxygen supply of team members over specified limitations\_\_\_2

This will apply to oxygen supply prior to starting work and be determined by the type of apparatus worn.

It does not mean minimum at end of problem.

6. Failure of captain to examine gauges, apparatus, and to have his/her gauges, apparatus examined before entering the mine, each apparatus\_\_\_2
7. Failure to make proper apparatus examination during any required apparatus check, each infraction\_\_\_1 (Maximum 5 Points)

Each team captain will examine gauges and apparatus of team members and have his gauge and apparatus examined by a team member.

A proper apparatus examination will include a visual examination of the gauge, facepiece, hoses, and determine by sight or feel, that the protective cover is secure. If the gauge has a protective holder, the gauge must be put back into the holder after viewing.

The team member making the check must obtain assurance from the person being checked that the person is all right. A verbal response from the person that he/she is all right will suffice.

8. Not wearing goggles in conjunction with an SCSR when smoke is encountered, each patient, each infraction\_\_\_2

Means any smoke.

9. Team members breathing external air in by the fresh-air base, each team member, each infraction (excluding patient)\_\_\_8
10. Team members breathing irrespirable air, each team member, each infraction\_\_\_10
11. Team not following proper procedure in case of apparatus failure, each infraction\_\_\_6

Proper procedure would depend on type of apparatus; however, team must proceed to fresh-air base immediately.

Proper procedure for returning simulated malfunctioning apparatus to use would be to take apparatus off and set it on the ground at the fresh-air base, then put it back on following the prescribed procedures for getting under oxygen.

12. Failure to properly protect patient, secure patient to stretcher, cover patient with blanket, or placing patient on stretcher in such a way as to foul proper operation of apparatus, each omission\_\_\_2

Failure to properly protect the patient shall be assessed when the team drops the patient.

Patient should be secured to stretcher by at least two bandages or straps, one around trunk of body and one around legs, covered with blanket from the neck to and including the feet and placed so as not to crimp air hoses. The bandages or straps shall be fastened perpendicular to the patient's body.

All unconscious patients must be brought to the fresh-air base on stretchers.

B. Auxiliary Equipment and Testing Devices

13. Failure to take necessary equipment and gas-detecting devices to work the problem, each omission \_\_\_\_2

Failure to take necessary equipment or testing devices underground; discount should be assessed even if team returns to fresh-air base to pickup necessary equipment.

14. The following equipment must be tested after the clock is started and before the entire team goes underground or inby the fresh-air base \_\_\_\_2

Stretchers: stretchers must be completely unloaded. Then, with a team member wearing an apparatus lying in a prone position, both ends of the stretcher must be lifted simultaneously. The stretchers cannot be lifted until the clock is started.

Team member can lie on stretcher prior to starting the clock for stretcher test but stretcher cannot be lifted prior to starting the clock.

Communication system: communications between the team and briefing officer shall be tested before the team advances inby the fresh-air base.

Fire extinguishers: extinguishers need not be activated, but a visual examination is necessary. Fire extinguishers shall be 2A10BC Rating and a minimum 5 pound capacity.

All gas detecting instruments used or taken inby the fresh-air base must be tested in the presence of a judge. (Gas detecting instruments will be left on during the working of the problem.)

15. Equipment failing to function properly upon testing, if not corrected before entering the mine, each infraction \_\_\_\_4

Faulty equipment must be left at the fresh-air base.

16. Failure to secure extra apparatus to stretcher \_\_\_\_2

Extra apparatus must be secured to stretcher to prevent it from falling off.

C. Communication and Signaling

17. Failure to arrange standard lifeline pull signals\_\_\_3

A team must arrange standard lifeline pull signals with the judge handling the lifeline after the clock is started and before the entire team goes underground or inby the fresh-air base.

18. Failure to give proper notification to the briefing officer with lifeline or communication system of team's intentions, (total discounts not to exceed 6 during working of problem) each infraction\_\_\_1

The following verbal or standard lifeline pull signals shall be used between the No. 5 team member and the briefing officer or lifeline judge:

Signal	Meaning
1 pull or "Stop"	Stop if traveling or "All Right" if team is at rest.
2 pulls or "Advance"	Team will advance and take lifeline from fresh-air base.
3 pulls or "Retreat"	Team will retreat and give lifeline to fresh-air base. If this signal is made from the fresh-air base to team, then team should return to fresh-air base at once.
4 pulls or "Help"	Team is in distress.

A team using a telephone or a mine rescue communication system must report its intentions to the briefing officer. Constant communication shall be maintained with the briefing officer unless a malfunction occurs.

A team will not be discounted if the communication system fails, if they change to using the standard lifeline pull signals. If the lifeline breaks, the team must immediately repair the lifeline or return to the fresh-air base.

Failure to notify the briefing officer with phone or lifeline of team's intentions would include advancing or retreating team inby the fresh air

base prior to notifying the briefing officer and receiving a reply. If the team is stopped and gives a signal to retreat or advance, the No. 5 team member must await return signal from the briefing officer prior to moving. When traveling and the No. 5 team member gives signal to stop, the No. 5 team member may not move more than two steps after receiving return signal from the briefing officer.

Signals need not be initiated by the Captain.

Improper signals would apply only to signals transmitted between the No. 5 team member and the briefing officer. If an improper signal is corrected prior to team moving, the team shall not be discounted. To correct an improper signal, the No. 5 team member gives a "Stop" signal prior to moving, then gives corrected signal and receives the reply from the briefing officer.

All team members must hold or be attached to the team lifeline while traveling. The team lifeline shall be not more than 28 feet in length and a nonextendable tagline not more than 36 inches in length may be used from a team member to the team lifeline.

19. The team must notify the briefing officer and obtain his or her permission before ventilation changes are made or power circuits energized\_\_\_2

Ventilation changes will be considered as starting, stopping, or redirection of the air current or changes of the constituents. Dropping a line curtain, extinguishing a fire, or opening a valve, is not considered to be a ventilation change. Boreholes cannot be used for ventilation purposes. The removal of any contaminant by the use of a line curtain and ventilating air current will require the inby end of the line curtain to be within five feet of the extent of the contaminant. If the extent of the contaminant is less than five feet inby the rib line, then the line curtain must break the imaginary rib line. If an existing check curtain is used to direct ventilation, the check curtain must first be converted into a temporary stopping. If water is being pumped, teams must wait until placards have been changed by the Contest officials before assuming the water has been lowered.

20. Failure to take lifeline or other communication system into the mine\_\_\_10

This would apply only if all team members were inby the fresh-air base.



21. In air clear of smoke, none of working team members having hold of lifeline\_\_\_2

Lifeline dropped by all members.

Does not apply on the surface or at the fresh-air base unless otherwise required by the Rules.

22. In smoke, any team member not having hold of lifeline, telephone line, or having either firmly attached to his/her person, each infraction\_\_\_2

Applies to any smoke. All team members must be in air clear of smoke before any team member drops lifeline. Would include checking entrances or portals inby the imaginary line of the openings. Any part of a team member (hand, etc.) in smoke, team member is in smoke.

D. Gas and Roof Testing

23. Failure of captain to test the roof, face, and/or ribs by the sound and vibration method, each infraction (maximum - 6 points at any one location except fires) \_\_\_2

Roof and rib tests need to be made only once where the roof is designated as unsafe, caved areas, prior to building a temporary stopping, building frames for a line curtain, rebuilding a stopping that is completely destroyed, converting an existing check curtain to a temporary stopping, and at faces.

No team member may perform work or move into any area during a team stop until the captain makes the appropriate roof examination for that area.

This would include either a sound and vibration method or a visual examination by the captain's physical presence. The one exception would be for designated areas of unsafe roof which are located in or on the imaginary line of an intersection. In these cases, the sound and vibration method must be made as soon as the captain discovers the placard indicating the unsafe roof. Team members may be in the intersection prior to the test being made.

Team member can follow directly behind the captain and make appropriate gas test as the captain makes roof test. (Roof test does not have to be completed for whole area.)

If it can be done safely, all roof tests shall be made from rib to rib, and the face, roof, and each rib at faces of places. Where conditions permit, the full extent of the condition requiring roof and/or rib tests shall be tested. All roof and rib tests shall be made using the sound and vibration method. No sound and vibration method roof and rib tests are required at the areas of overhanging brows or unsafe ribs.

The proper way to make roof tests along an extended area of unsafe roof would be to make roof tests from rib to rib at the outby end of the unsafe roof, zigzag between the edge of the unsafe roof and the adjacent rib, and make tests from rib to rib at the inby end. See Figure 1(a) and 1(b).

Prior to extinguishing a fire, roof and rib tests shall be made from rib to rib. When a fire is in an intersection, the tests must be made from imaginary rib line to imaginary rib line, perpendicular to the direction of team travel in the area the team member(s) work to extinguish a fire. The initial roof test, prior to extinguishing a fire, will suffice until the team advances (meaning that the No. 5 person passes the fire) or the team retreats and returns to the fire area; at which time a roof test will be required. Thereafter, roof and rib tests perpendicular to the route of travel must also be made prior to each time a team member(s) travels through the area where the fire was located. The entire team traveling through the area as a unit would only require one test. (This test must be made by the captain before any team member travels past the location of the fire.) One test will suffice at each team stop after the fire is extinguished.

Roof test of fire at intersection must be perpendicular and from imaginary line to imaginary line. However, a zig zag roof test will be acceptable as an alternative test on subsequent trips through the fire area if a diagonal ventilation structure has been installed. (Diagonal structure will not have to be removed and the test will be comparable to the roof test illustrated for diagonal unsafe roof).

The roof and rib test must be made at all fires, including inextinguishable fires.

24. Failure to make necessary gas tests where required, each omission\_\_\_2
  - A. If conditions permit, tests for carbon monoxide, methane, and oxygen deficiency shall be made at each team stop that is required by the problem or rules during initial exploration in unexplored areas and at

the following normal areas to be tested: all mine entrances; entrances to sections of the mine to be explored; faces; walls of overcasts or undercasts, stoppings, ventilation doors, barricades, and seals, (if intact and airtight); all fires; sample pipes or tubes in airtight seals (valves must be opened before testing if closed); open boreholes; and exhaust fans.

Gas tests made during apparatus checks are not normal areas to be tested.

- B. Carbon monoxide, methane, and oxygen deficiency tests shall be made in each opening to an intersection before the team advances from that intersection. Gas tests need not be made from rib to rib. Tests may be made at any location in the opening within 25 feet from the original stopping point of the captain or No. 5 team member if conditions permit. In order to properly check an opening, mine entrance, or section entrance, the gas detecting instruments used shall be extended inby the imaginary line of the rib lines of the openings or entrances. However, openings or entrances containing unsafe roof, caved areas, water over knee deep from rib to rib at or outby the imaginary line to the opening shall be tested immediately outby the condition.

Teams passing an opening without first checking that opening and making necessary gas tests shall be discounted. Teams advancing inby an opening to a point that the No. 5 team member is at or inby the rib will be considered to have passed that opening.

- C. Teams must check all entrances to the area to be explored prior to the entire team going underground or inby the fresh-air base. Entrances may be checked in air clear of smoke without the use of a lifeline so long as the entire team does not go underground or inby the fresh-air base. The captain shall not advance more than 25 feet inby the imaginary line of the opening prior to the entire team advancing underground or inby the fresh-air base.

Teams will be assessed two points for each required gas test that is not taken, thus if team fails to test for all gases in an opening this will be a six point discount.

- D. The constituents of the air enclosed by separations intended or indicated to be airtight will be considered unknown and must be

determined by the Captain before other team members enter such area. Actual constituents may be indicated by the use of placards. If a stopping has a hole in it, a gas test is not required prior to entry.

- E. When smoke is encountered, it will be considered to extend to a placard indicating the smoke is cleared or a separation intended or indicated to be airtight. If carbon monoxide, methane, or oxygen deficiency is found in an opening containing a separation intended or indicated to be airtight, the gas will be considered to extend to the airtight separation unless otherwise indicated. If carbon monoxide, methane or oxygen deficiency is encountered in other locations, it will be considered to extend to the next normal area to be tested for that gas, at which time the continuance or discontinuance of the gas will be determined by placards or by results of the tests. See Figure 4.
  - F. Areas in which gas tests have been performed need not be retested when a team re-enters the area unless ventilation has been changed. Upon re-entry into any area where the ventilation has been changed, including subsequent ventilation changes, teams shall make examinations for carbon monoxide, methane and oxygen deficiency at the location of all placards where any of these gases were encountered on the initial exploration into the area. These tests shall be made prior to the entire team passing the placard. Tests are not required at other locations upon re-entry.
25. Improper procedure when testing with gas detectors, testers, and indicators, total discounts not to exceed 6 points per team member during working of problem\_\_2

A proper test for methane, carbon monoxide and oxygen shall require the following actions by the team:

METHANE - Detector shall be held at eye level or higher

CARBON MONOXIDE - Detector shall be held at chest (between neck and waist) level

OXYGEN DEFICIENCY - Detector shall be held below the waist level

The team member shall verbally identify each test.

E. Miscellaneous

26. Failure of team captain to legibly mark date, initials, and team number on the check board at mine portal or fresh-air base or to start timing device promptly after receiving the problem and map, each omission\_\_\_2

Captain must legibly mark date, initials, and team number on check board after clock is started but before the entire team travels inby the fresh-airbase.

Team number means the team's working position number drawn during registration at the Contest.

27. Failure of the captain to mark legibly, with chalk, the date and his/her initials on barricades, stoppings, ventilation doors, seals, regulators, walls of overcasts and undercasts, and check curtains converted to stoppings, and at the location of all faces, bodies, live persons and points where objects/conditions prohibit further travel in that direction, not to exceed 12 points\_\_\_2

These dates and initials must be marked at or on each required location, during the initial exploration, before the team advances or retreats from that area.

Dates and initials are not required if the live person or body cannot be reached due to the conditions of the mine.

The captain must mark the date and his/her initials on team built stoppings, at each location where they are constructed, after the building process has begun but before the clock is stopped or the stopping is moved.

Such places only need to be marked once. Date and initials are not required at ventilation controls completely destroyed.

Date means correct month, day, and year.

28. Failure of teams to stop within 50 feet of the fresh-air base to check team members and apparatus\_\_\_4

The first examination must be made when the team is stopped within the first 50 feet, and with all team members underground or inby the fresh-air base to check apparatus.

This examination must be made at the first stop when entire team is inby fresh-air base or portal even though the 50 foot limit has not been reached. This examination is also required on the affected apparatus upon initial re-entry inby the fresh-air base after such apparatus has been repaired or changed.

The team captain shall not exceed 50 feet; however, all team members must be underground, inby the fresh-air base or bottom of air shaft. When the team enters the mine through an air shaft, this examination must be made within 50 feet of the bottom of the air shaft.

29. Any team member traveling more than 25 feet from the captain or No. 5 team member's original stopping point, each infraction\_\_\_2

During initial exploration, when a team advances into an intersection and makes a team stop, exploration into the openings will be limited to 25 feet from the captain or No. 5 team member's stopping point or to the imaginary line of the next intersection, whichever is the lesser distance. (The Captain's stopping point cannot be inby the imaginary line of the next intersection.) See Figure 5.

When crosscuts are staggered and the inby rib of one crosscut is even with the outby rib of the opposite crosscut, the two intersections shall be treated as one continuous intersection for the purpose of team stops only. Rule 24B, gas testing, and Rule 45A, systematic exploration, are still applicable. See Figure 6.

The 25 foot limit shall also apply when the team is attached to the lifeline.

30. Captain or other team member who acts to endanger self or patient, 5 points each team member or patient, each infraction (three or more persons involved will be considered as entire team endangered) maximum 15 points each occurrence\_\_\_5

Each team member that endangers self will be assessed points for each endangerment (when less than three members are involved as described below):

- A. Travel under unsafe roof, unsafe rib, or overhanging brow. See Figure 2.

Teams supporting unsafe roof:

1. If both ends of the unsafe roof have been previously tested by sound and vibration method, timbers must be set in sequence as follows:
  - a. set first timber outby unsafe roof
  - b. set additional timbers in unsafe roof at no more than five foot intervals
  - c. set last timber inby unsafe roof before any other work is done or team members pass through the area
2. If neither end of the unsafe roof has been examined by the sound and vibration method, roof testing and timbers must be set in sequence as follows:
  - a. test roof on outby end of unsafe roof (Rule 23)
  - b. set first timber outby unsafe roof
  - c. set additional timbers in unsafe roof at no more than five foot intervals
  - d. set last timber inby unsafe roof
  - e. test roof on inby end of unsafe roof before any other work is done or team members pass through the area (Rule 23)

Outby/inby verbiage is interchangeable depending on the direction the unsafe roof is approached.

- B. Travel into or through water over knee deep. When water is encountered, the extent of the water will be denoted by placards.

- C. Passing a fire in the same opening or intersection the team is traveling without first extinguishing the fire.
- D. Not immediately retreating to the fresh-air base when the manufacturer's warning device of the apparatus is activated. If visual contact has been made with a patient, the patient may be removed simultaneously with the team. (No additional work such as setting/retrieving timbers or the completion of building any structure can be done to rescue the patient.) The team may perform gas test, roof and rib test and D&I's at such location, but may not advance in by the captain's location at the time of the activation or simulation.

The activation of the warning whistle will require the team to return to the fresh-air base and change out the apparatus or bottle. If the activation of the warning whistle is a simulated event, the team may simulate replacement (may verbally state changing bottle). Upon re-entry, the 50-foot apparatus check must be made.

- E. Removing any roof support that is set, whether found or installed by the team.
- F. Ventilating an unexplored area with irrespirable air when the location of a potentially live person is unknown. Any unaccounted for person is considered to be a potentially live person. If a team explores all sides of overcasts or undercasts, all ends of ventilation tubes and the bottom of shafts, the in-between areas are considered explored. This discount will be assessed for each irrespirable mixture passed over each unexplored area ( $\# \text{ of mixtures} \times \# \text{ of areas} \times 5 \text{ point discount} \times \# \text{ of unaccounted for persons (maximum 3 persons)}$ ).

When a body is located in an area of elongated unsafe roof and the team finds and maps the body, the location of the body will be considered known. This will apply even if there are conditions that prevent the captain from physically examining the body.

- 31. Any act by a team which may result in an explosion of an explosive air/gas mixture\_\_\_30 This discount will be assessed for each explosive mixture passed over each unexplored area or ignition source ( $\# \text{ of mixtures} \times \# \text{ of areas} \times 30 \text{ point discount}$ ).



- A. Changing conditions of the mine ventilation system in such a manner that an explosive mixture is moved over an ignition source.
- B. Continuing exploration after conditions are found to indicate an imminent explosion is possible by the presence of an explosive mixture and evidence of fire (visual acknowledgment of a fire, smoke or carbon monoxide above 10 ppm), or continuing exploration when energized electrical equipment, energized circuits (including all batteries except cap light batteries) or energized cables are found in an explosive mixture.

When a withdraw situation exists at an intersection, the team can go to any location they have already explored at that stop, prior to exiting the mine. The key phrase in this paragraph is “at that stop.” The intent of this is once teams start exiting the mine, the team continues to follow their lifeline until they have retreated in the fresh air base. This would not allow teams to go to other areas in which they had already explored or go back to the intersection in which the withdraw situation existed. This would also apply to withdraw situations encountered not in an intersection.

A team must continue to explore if it knows there is a continuous nonexplosive separation between the explosive mixture and the evidence of fire or energized cables.

- C. Changing conditions of the mine ventilation in such a manner that an explosive mixture is moved over an unexplored area. If a team explores all sides of overcasts or undercasts, all ends of ventilation tubes and the bottom of shafts, the in-between areas are considered explored.
- D. Changing conditions of the mine ventilation in such a manner that an explosive mixture is moved over energized electrical equipment, energized electrical circuits (including all batteries except cap lamp batteries) or energized cables. Energizing electrical equipment, electrical circuits, or cables in an explosive mixture, or moving any of the above ignition sources into an explosive mixture.

An explosive mixture will be present when the methane is between five and fifteen percent inclusively and the oxygen is 12.1 percent or greater. Both methane and oxygen concentrations must be shown on the placards.

32. Failure to locate missing persons, each omission\_\_\_10

The team must stop and the captain examine, by touching with his or her hand, all missing persons (live persons or body) prior to any team member passing the location of the missing person. This will not be considered a team stop by the rules for the purpose of gas testing.

If the Captain cannot physically examine a missing person located under elongated unsafe roof due to a lack of roof support, a team stop will not be required.

Bodies located under elongated unsafe roof must be examined before the clock is stopped if roof support is provided. See Figure 3.

33. Failure to bring live person to the fresh-air base, each omission\_\_\_20

Self-explanatory.

34. Failure to properly protect a live or potentially live person(s), each omission\_\_\_10

Proper protection must be used on persons exposed to or found in irrespirable atmospheres. Atmospheres containing less than 19.5 percent oxygen, concentrations of carbon monoxide in excess of 50 PPM or smoke are irrespirable atmospheres. In an irrespirable atmosphere, unconscious patients must be protected by approved apparatus with full face pieces. On a conscious person, if conditions permit, an approved self-rescuer may be used. Training models may be used if sterilized and properly assembled. Simulation of proper donning of approved respiratory apparatus shall not be permitted.

35. Failure to remove irrespirable atmosphere\_\_\_30

If an irrespirable atmosphere is encountered immediately outby a barricade, the team must remove the irrespirable atmosphere before breaching the barricade. If an irrespirable atmosphere is encountered immediately outby an airtight ventilation structure and verbal contact is made with patient, the team must remove the irrespirable atmosphere before breaching the structure.

36. The atmosphere for the briefing officer shall remain respirable. This cannot be achieved by the use of an apparatus.\_\_\_10

The briefing officer cannot be relocated at the fresh-air base to allow irrespirable air to flow across his designated location.

37. All five team members running while advancing or retreating, total\_\_\_4
38. Team member talking to or receiving information from an unauthorized person without permission of the judges, each infraction\_\_\_5

Unauthorized information given to the team by the patient would be prohibited.

A person behind a barricade, stopping, etc. may relay information by reading aloud a statement furnished by the judges. No other information on conditions behind the barricade is permitted to be relayed to the team.

39. Failure to follow proper procedure when putting apparatus on patient, each infraction\_\_\_2

Mask tightness test is not required for an unconscious patient.

40. Assistance lent by supposedly unconscious patient, each infraction\_\_\_2

Would cover patient sitting up unassisted or moving arms so as to help in putting on apparatus, or unconscious patient communicating with team.

41. Teams leaving patient unattended, each infraction\_\_\_6

A team member must be within 10 feet of the patient to be considered attended.

42. Failure to remove patient(s) promptly to the fresh-air base, each infraction\_\_\_6

A. When a team finds a patient(s), either by visual or verbal contact, every effort must be made to remove them safely and promptly to the fresh-air base. Visual contact will require the captain's presence in the area. Verbal contact is any voice communication from the patient(s) that can reasonably be expected to be heard by the team.

- B. When a team reaches a patient(s) (visual contact), every effort must be made to remove them safely and promptly to the fresh-air base. Exploring ahead of the location will be limited to 25 feet in any direction. The 25 foot limit will be determined from the stopping point at or outby the patient(s).

The team may perform any function during this team stop. The team may not continue to explore while retreating with the patient, unless required by the problem design.

- C. If the team is in verbal or visual contact with a patient, and the team is unable to immediately reach the patient due to the conditions of the mine, the team may continue to explore if necessary for its own or the patient's safety. During this exploration process, the team may perform any function during team stops. Every patient shall be safely and promptly removed from the mine as soon as means and/or materials are available.
1. If a team finds a patient(s) under or inby an area of unsafe roof and has the necessary roof support available to recover the patient(s), the team must stop and recover the patient. If a team subsequently finds necessary roof support to recover the patient(s), the team must stop (prior to the No. 5 team member passing the roof support), retrieve the roof support and recover the patient(s). The team may perform any function during this team stop.
  2. If a team finds a patient(s) inby an area of water over knee deep and has a pump available to pump the water, the team must stop and recover the patient. If a team subsequently finds a pump, the team must stop (prior to the No. 5 team member passing the pump), retrieve the pump, pump the water and recover the patient(s). The team may perform any function during this team stop. Exploration may continue, if necessary, to ventilate an explosive mixture prior to energizing the pump.

43. Failure to erect temporary stopping (airlock) when necessary, each infraction\_\_\_6

Before breaching stoppings, doors, seals, barricades, closed regulators, or removing water roofed, an airlock must be formed if conditions on the other side are unknown. This does not apply to existing check or drop curtains used to direct the air current. When retreating out of a barricade or coming back through a stopping where an airlock has been erected, it will not be necessary to airlock on the way out if this will not change any existing ventilation.

If a person behind the barricade, stopping, etc. verbally relays to the team that the area is "airtight", an airlock is not required.

An airlock is formed by erecting a temporary stopping at a location(s) that will provide the equivalent airtight separation as the airtight structure or condition breached by the team.

44. Failure to erect temporary stopping, reasonably airtight, each infraction\_\_\_2

Curtains used to erect temporary stoppings shall be fastened at the top and sides, and at the bottom when a bottom board is provided. Top and bottom boards shall not be nailed to the uprights by the teams when stoppings are erected.

If a structure is moved from one location to another, it must be completely dismantled prior to moving (includes curtains installed on frames).

If temporary stoppings are built using curtains with velcro straps, they will be considered reasonably airtight for ventilation purposes. If a strap is not fastened properly, this discount shall apply.

45. Failure of team to explore or examine workings systematically and thoroughly, each omission\_\_\_4

Definitions:

Inaccessible: All areas of the mine where team travel is blocked by one or more of the following conditions: seals; unsafe roof rib to rib; inextinguishable fires; water over knee deep and caved areas.

Opening: Any entry or mining that was performed off an entry, room, or crosscut that may or may not connect to another entry, room, or crosscut.

Crosscut: An opening that connects two entries.

Contaminant: Any one or more of the following: smoke; carbon monoxide above 10 PPM; methane above one percent; or less than 19.5 percent oxygen. An entry or crosscut will be considered contaminated until the team finds the end of the contaminant.

- A. This should be assessed for not exploring all areas of mine that can be explored without endangering team if problem requires entire mine to be explored or leaving accessible areas unexplored outby where team is working and for passing accessible openings.
- B. Unless blocked, teams must advance in the contaminated entry or in entries adjacent to the contaminated entry. When a contaminated entry and adjacent entries are blocked, teams may explore/advance in other nearest accessible entries. However, the team will be discounted if it fails to return to the contaminated or adjacent entry at the first accessible opening, and if not blocked, make all further explorations in the contaminated or adjacent entries before advancing into other areas of the mine.
- C. When advancing in an entry and an intersection is encountered with accessible crosscuts on both sides, the team would be required to tie across into the contaminated crosscut first.
- D. Passing or failing to explore an accessible opening to a crosscut.

Team would be required to travel into this opening and tie across into the next intersection. Teams cannot advance from this intersection before tying outby unless the outby entry is blocked. Teams advancing inby an opening to a point that the No. 5 team member is at or inby the inby rib line will be considered to have passed that opening. If a contaminant is found in an accessible crosscut, teams would be required to tie across in this crosscut after accessible outby areas have been explored.

- E. Where crosscuts are blocked, the No. 5 team member may not advance beyond the inby corner of the second crosscut before the team ties across and/or behind into all accessible areas outby that crosscut. Where crosscuts are staggered, the second crosscut will be determined by two crosscuts on the same side, either left or right, in the entry being traveled. After the accessible areas outby are completely explored to the side where the two crosscuts were determined, the team will be permitted to explore the original entry until it encounters the second crosscut to the other side. This may require building an airlock or ventilation controls such as a stopping, door, etc., or returning to the fresh-air base, and exploring into other entries at the discretion of the team and according to the conditions of the mine.
- This rule requires team to make all accessible areas outby the second crosscut limit (this would include all sides of areas that are inaccessible such as caved, etc.).
- F. Inaccessible areas need not be explored unless the team has explored all accessible areas and there are unaccounted for persons or an explosive mixture to be moved through the inaccessible (unexplored) areas.
- Teams will be required to pump water or support the roof to explore the inaccessible areas in these cases, if the necessary materials are provided in the problem.
- G. Exploration behind seals is not necessary, unless required by the problem and then only after all accessible areas of the mine are explored.
- 46. Only the ventilation material provided will be permitted to be used during the working of the problem. Erected walls of overcasts/undercasts cannot be removed or altered by the team. Other structures located on the course shall be completely disassembled when moved to other locations.\_\_\_\_10
  - 47. Less than five team members completing problem, each person\_\_\_\_8

Self-explanatory.

48. Failure to examine lunch pails, each infraction\_\_\_2

Lunch pails may contain important information and therefore shall be examined. Any team member may examine the lunch pail provided he/she does not exceed the 25 foot limit of the captain or No. 5 team member at a team stop. Lunch pails under unsafe roof need not be examined unless teams enter the area.

49. Any act by a team member that violates the intent of the problem design layout, each location\_\_\_10

This would include traveling into or passing materials through areas indicated to be impassible by placards or intended to be impassible by the physical condition indicated.

Examples of such areas would include, but not be limited to, caved areas, ribs, faces, water roofed, etc.

Isolating equipment, or other energized electrical components with structures other than those depicted in the legend will not be acceptable.

Ventilation structures built by the team may only be placed perpendicular across an entry, crosscut, or opening, or diagonally from corner to corner at intersections. (Exception: Brattice frames and brattice cloth may be used to erect a line curtain which can only extend from a face or barricade to the outby intersection.)

Team members holding up brattice cloth in an attempt to clear a contaminant shall be discounted under this rule and the contaminant shall not be cleared.

50. Failure to comply with other written adopted National Rules not covered in Discount Sheets, each infraction\_\_\_2
51. Failure of team to follow written instructions provided to the team for working of the Contest problem\_\_\_15



# PROPER METHOD OF ROOF TESTING

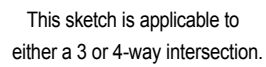
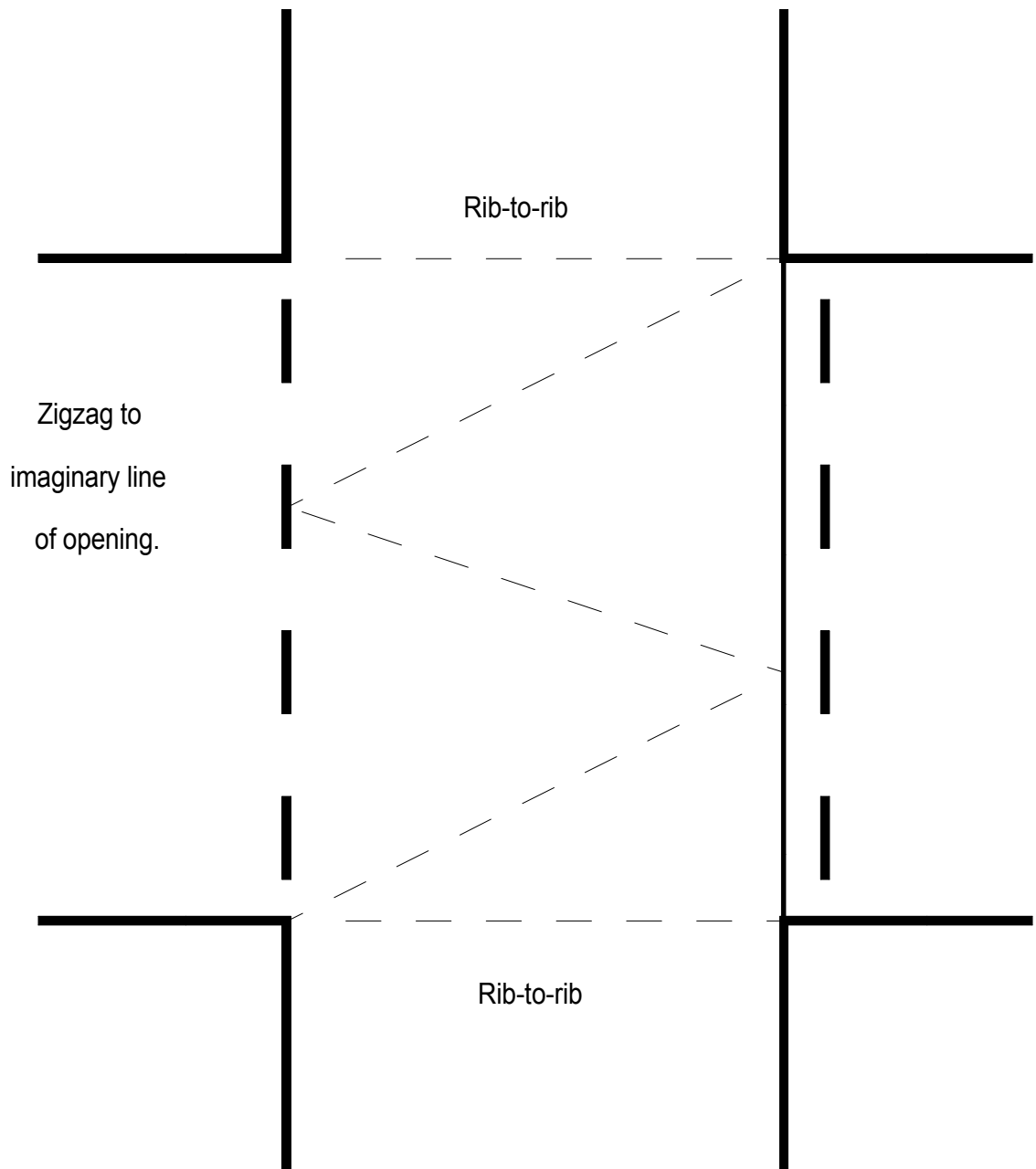


Figure 1(b)

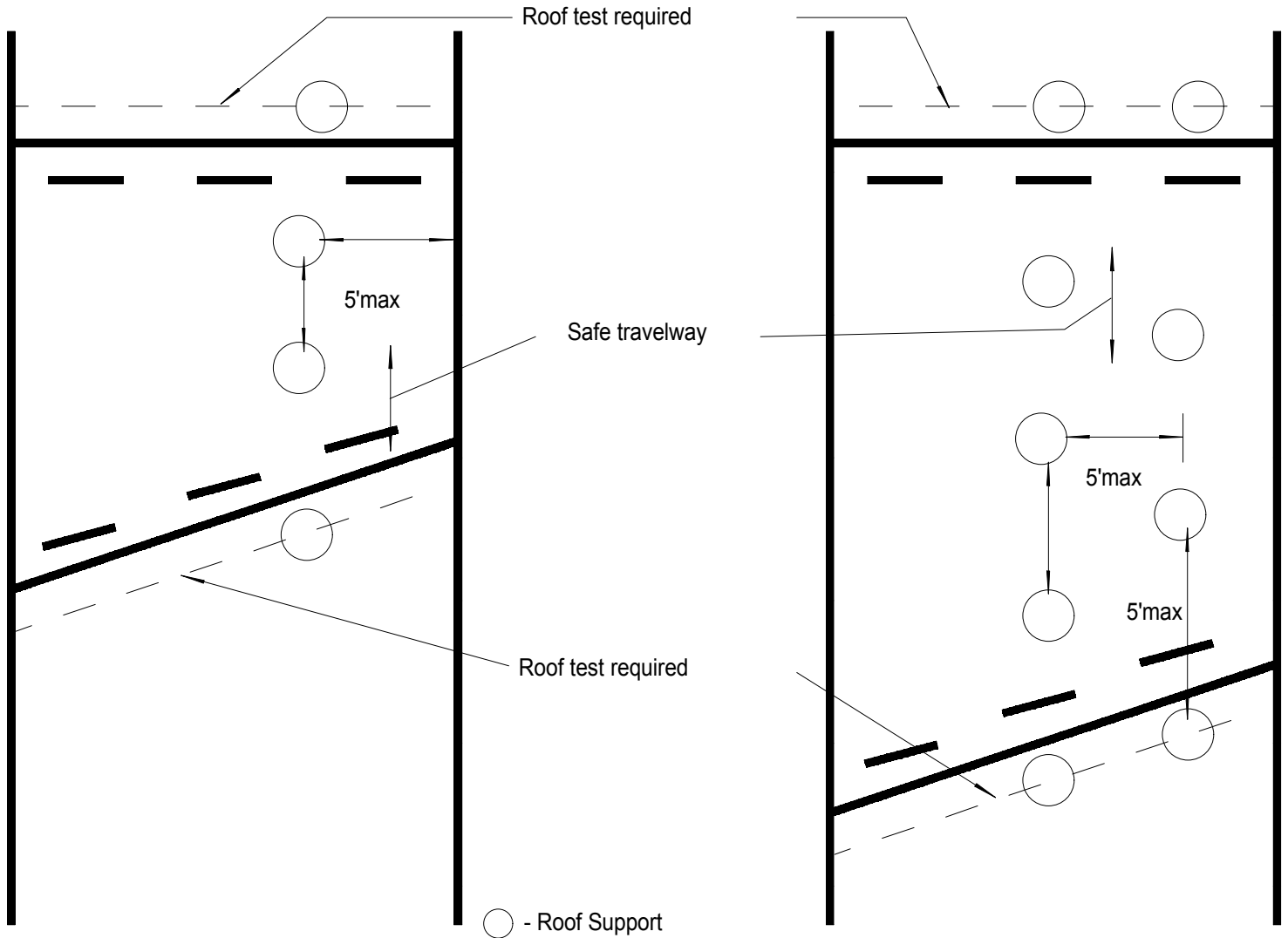
## PROPER METHOD OF ROOF TESTING (cont.)



This sketch is applicable to either a 3-way or 4-way intersection.

Figure 2

## EXAMPLES OF PROPER METHODS OF SETTING ROOF SUPPORTS



5' maximum width travel way may be established between one row of supports and a safe rib or between two rows of supports.

No roof test required IN area of unsafe roof.

Simulate setting support by standing in proper location and then placing on floor.

If the unsafe roof is less than 5 feet in length, a minimum of three supports must be set; one on each end and one under the unsafe roof.

Figure 3

# PROPER INSTALLATION OF ROOF SUPPORT TO RECOVER A PATIENT LOCATED UNDER AN AREA OF ELONGATED UNSAFE ROOF

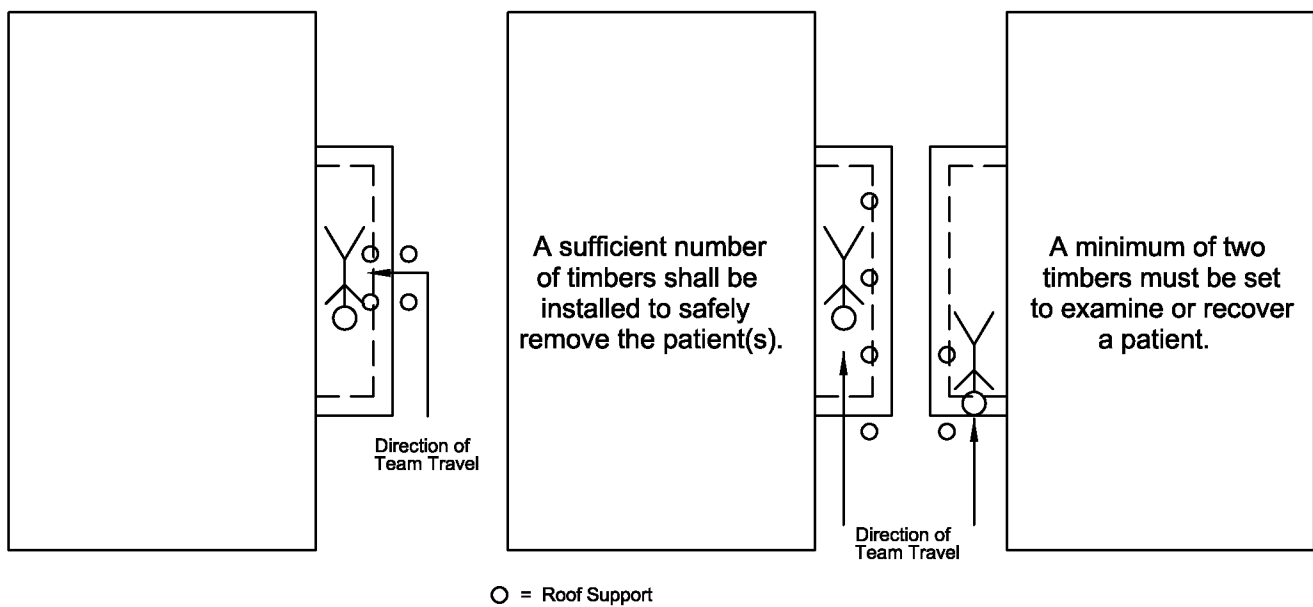
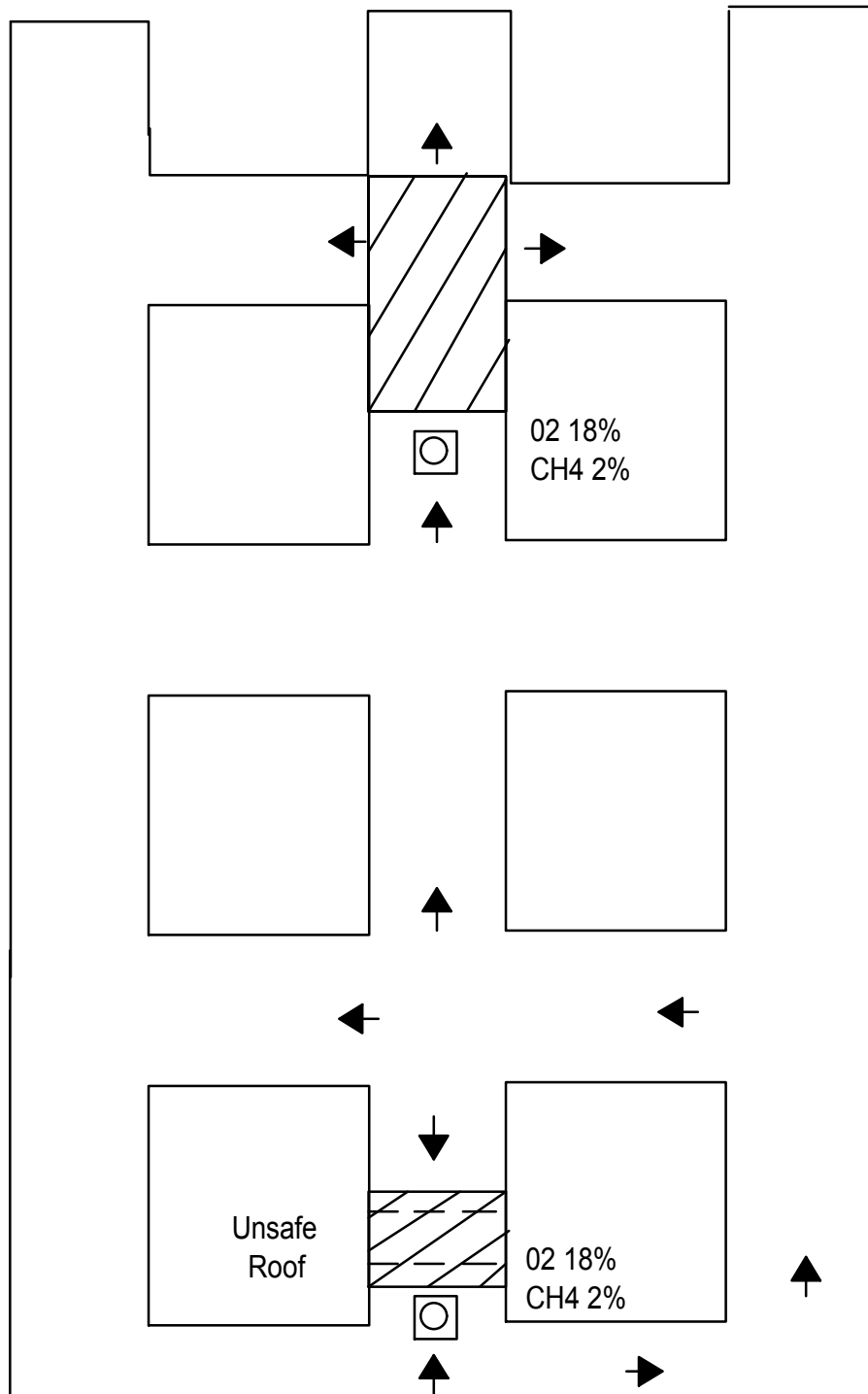


Figure 4

## EXTENT OF GAS SKETCH



Direction of Team Travel affects extent of gas found.  
Arrows indicate team travel after gas is found.  
Diagonal lines indicate extent of gas.

Figure 5

## Example of Initial Exploration Under Rule 29

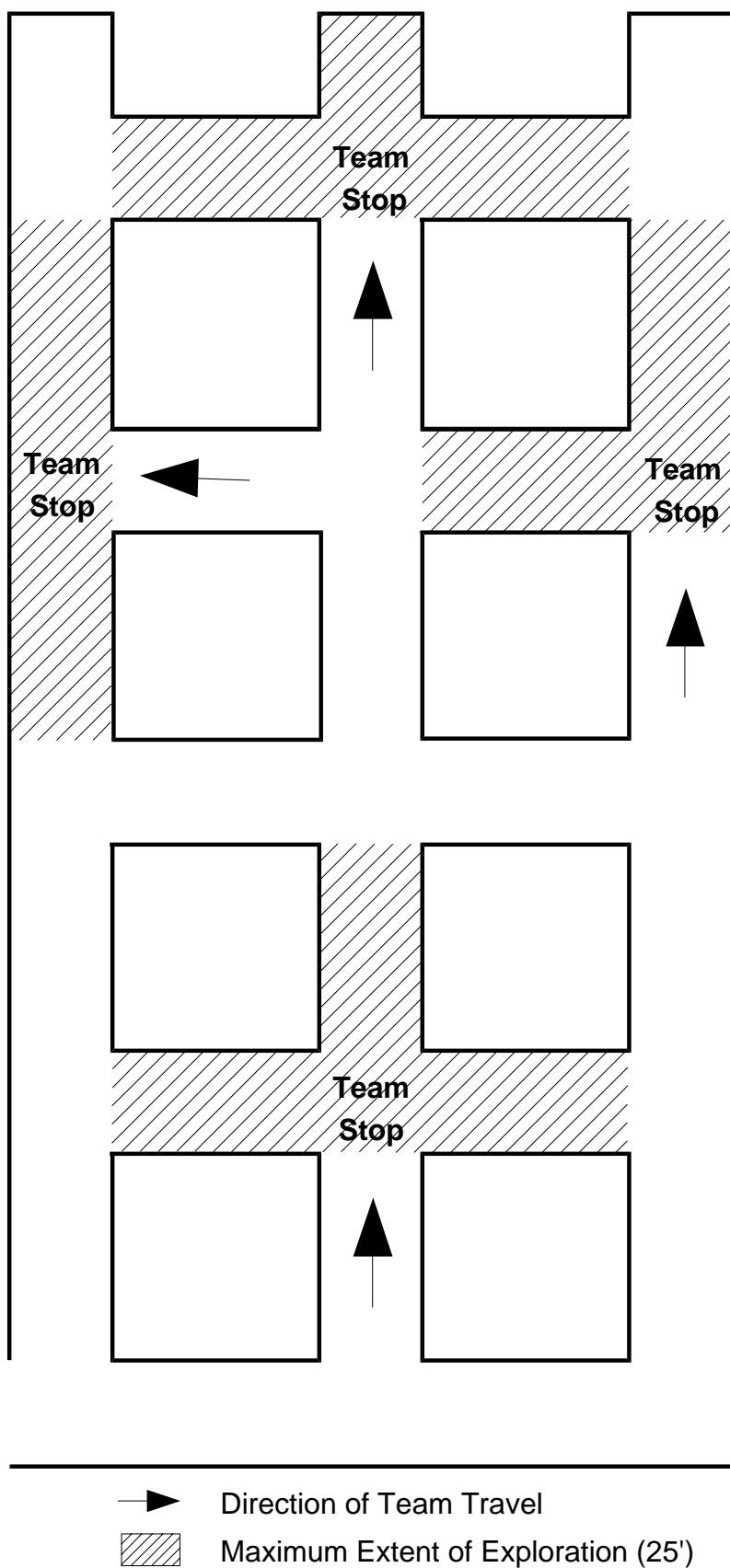
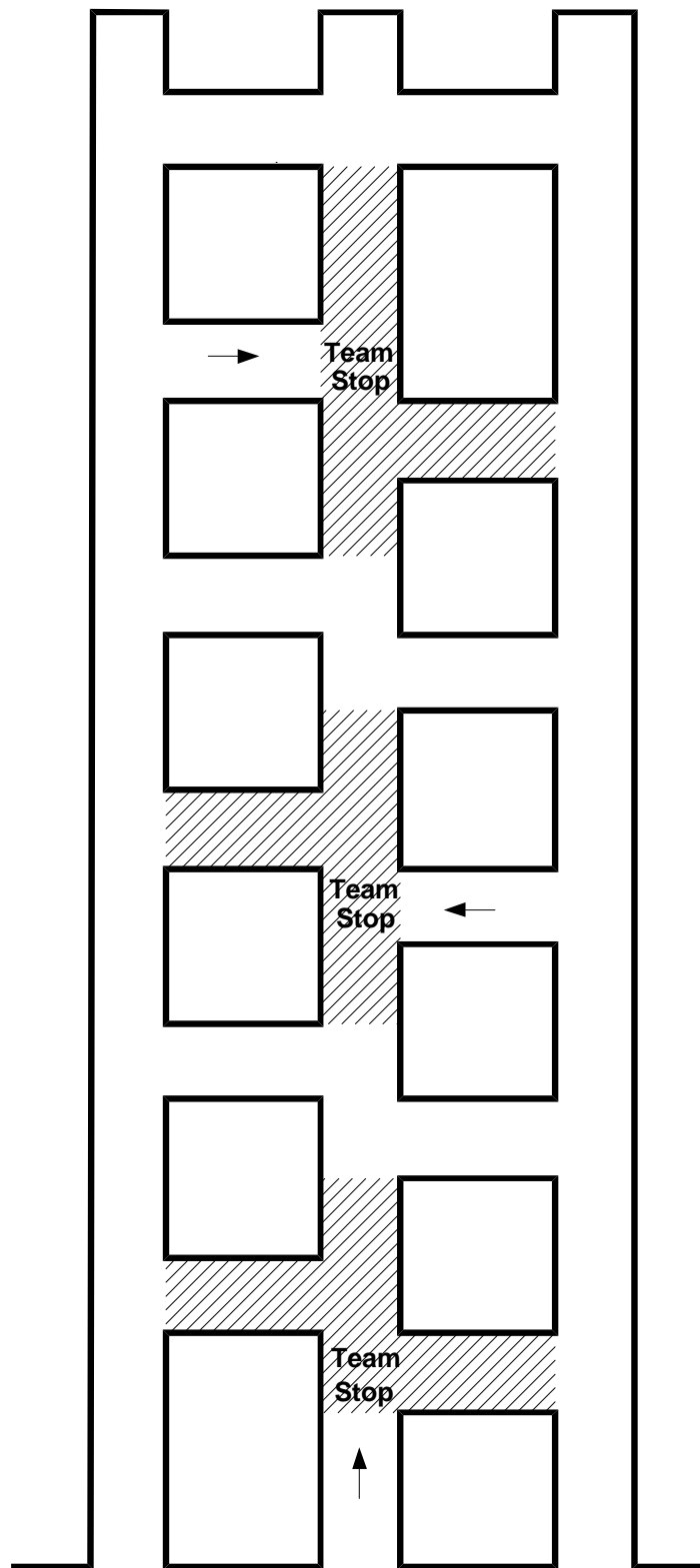
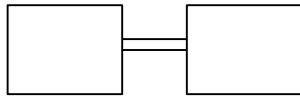


Figure 6  
Staggered Crosscuts - Rule 29

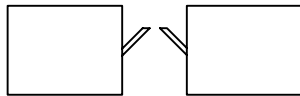


→ Direction of Team Travel  
Maximum Extent of Exploration

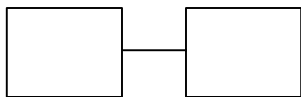
# MINE MAP LEGEND



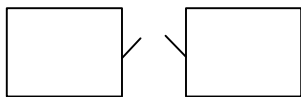
**PERMANENT STOPPING**  
Stopping intact, airtight (No indication of opening(s) or leakage).



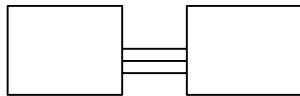
**PERMANENT STOPPING NOT INTACT, NOT AIRTIGHT**  
Condition noted on placard must be shown on the map.



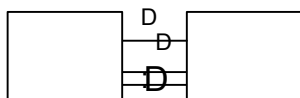
**TEMPORARY STOPPING**  
Stopping intact and airtight, this symbol must be used for all newly erected, intact and airtight, structures built by the team.



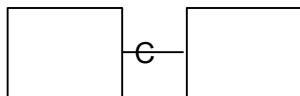
**TEMPORARY STOPPING NOT INTACT, NOT AIRTIGHT**  
Condition noted on placard must be shown on the map.



**SEAL**  
If the seal is equipped with devices such as sampling tubes or water traps, or is damaged, leaking, or destroyed, that particular device or condition must be noted beside the symbol.



**DOOR**  
Can be shown by itself or in ventilation controls. However, the type and size (if indicated by placard) and "open" or "closed" must be written out.

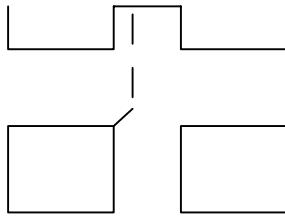


**CHECK CURTAIN**  
Condition noted on placard must be shown on the mine map.



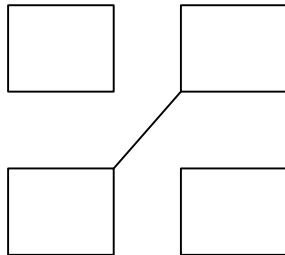
**LINE CURTAIN**  
Designated curtain provided for removing contaminant or explosive gases. Hand held by the team.





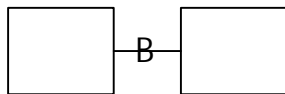
### LINE CURTAIN INSTALLED

The full extent of the line curtain shall be shown. If the line curtain is partially or completely down, it must be noted beside the symbol. Can not be folded or rolled up.



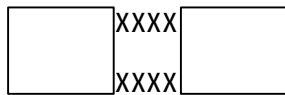
### DIAGONAL

Temporary stoppings used to form a diagonal in an intersection, shall extend from corner to corner.



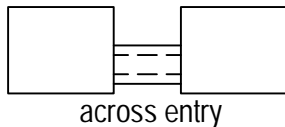
### BARRICADE

If the placard indicates that the barricade is damaged, leaking, or destroyed, that particular condition must be noted beside the symbol.



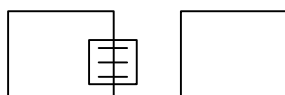
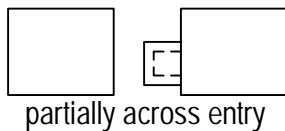
### CAVED

Caved areas are not considered airtight unless the placard states "airtight" and it will have to be written out on the map ("airtight") beside the symbol.



### UNSAFE ROOF

Placard must state "unsafe roof". Any other condition designated must be noted beside the symbol. Outline size if indicated by placard or markings

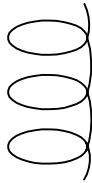


Project over ribline and area on map.



### WATER

Symbol indicates start and end of water or changes in depth of water. Write out depth(s) as shown on placard.



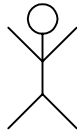
### SMOKE

Write out "light" or "dense" if indicated on placard; draw in entire extent of smoke.



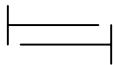
### BODY

Indicate position of head and feet as body is found. If the word "body" is on the placard, show symbol for body and denote the additional information that is shown on the placard.



### LIVE PERSON

Write out condition indicated on the placard, such as conscious, unconscious, walking, etc., indicate position if lying down.



### BRATTICE FRAMES

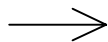


### BRATTICE CLOTH



### PLACARD INDICATING GAS MIXTURE

Write out gas name or symbol and state percent or PPM if shown on placard.



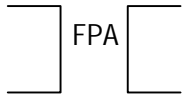
### AIR MOVEMENT

Write out quantity if shown on placard.



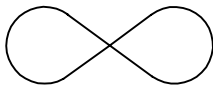
### FIRE

Write out "smoldering", "raging", etc., if shown on placard. The fire symbol must be placed over the object on fire.



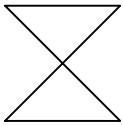
#### FARTHEST POINT OF ADVANCE IN ENTRY, ROOM, OR CROSSCUT

This symbol should only be used where areas inby the farthest point of advance will not be explored.



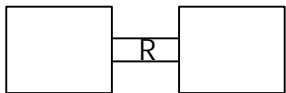
#### FAN

Write out conditions of fan as indicated by placard.



#### OVERCAST OR UNDERCAST

This symbol is to be used for placards indicating "overcast/undercast" or "overcast wall". If the overcast or undercast is damaged, leaking, or destroyed that particular condition must be noted beside the symbol.



#### REGULATOR

The particular condition must be noted beside the symbol.

The letter "R" can overlap the parallel lines.



#### LOCATION OF ANY OTHER OBJECTS, CONDITIONS, OR EQUIPMENT

Write the name of the object, condition, or equipment by the symbol.  
This also includes faces if indicated by a placard.



#### ANY ROOF SUPPORT INSTALLED BY THE TEAM

NOTE: Two maps will be provided to each team. The scale on the maps will be 1 inch is equal to 10 feet.

(for Contest work only)

**SELF-CONTAINED BREATHING APPARATUS**

**Draeger 174, BG174, or 174A, Two, Three, or Four-Hour  
Self-Contained Breathing Apparatus**

- A. Procedures for getting under oxygen:
  - 1. Bring mask close to face and open cylinder valve fully; then close one-half turn. Face mask straps may be placed over the head and the mask allowed to hang loosely prior to opening cylinder valve. This will suffice for bringing the mask close to the face.
  - 2. Put on facepiece properly and tighten straps; observe gauge.
  - 3. Block off both breathing tubes. It should be impossible to draw in any air when inhaling and hard to expel air to the outside when exhaling.
  - 4. Check gauge and operation, straps, etc., prior to leaving fresh-air base.

**Biomarine, Biopak 240 Donning Procedures**

- A. Don facepiece
  - 1. Tighten lower straps simultaneously
  - 2. Tighten temple straps simultaneously
  - 3. Tighten forehead strap (if face piece has this strap)
- B. Simulate the inhalation valve check by verbally stating:

“I am using my hand to block the inhalation port of the face piece and inhaling. There are no leaks present. I am removing the hose cap and reconnecting the inhalation hose to the face piece”. (This can be stated by the captain.)
- C. Perform exhalation valve test
  - 1. Grasp exhalation hose and exhale
- D. Open oxygen bottle valve full counter clockwise and then turn back 1/4 turn

### **Draeger BG-4 Self Contained Breathing Apparatus**

- A. Procedures for getting under oxygen:
1. Put on facepiece properly and tighten straps. Open cylinder valve fully, then close one-half turn.
  2. Observe the Monitron Pressure Gauge and Warning Module:
    - (a) Green indicator light - Apparatus O.K.
    - (b) Red Indicator light - Apparatus faulty
    - (c) PSI Reading
  3. Tightly squeeze both breathing hoses and breathe in until a vacuum is produced. Hold your breath for an instant; the vacuum must be maintained, otherwise the straps on the mask must be tightened.
  4. Check gauge and operation, straps, etc., prior to leaving fresh-air base.

(for Contest work only)

## **DETECTING INSTRUMENTS**

### **CMX 270 Continuous Carbon Monoxide, Methane, and Oxygen Monitor**

#### **A. Checking instrument:**

1. Turn unit on by backing off knurled knob and inverting calibration cover. Tighten knurled knob. (Do this prior to starting the clock for the working of the Contest problem.) Visually inspect the digital display.
2. In the battery failure mode, the liquid crystal display (LCD) becomes blank except for the numeral "1" and the word "LOBAT", and the audible alarm sounds a continuous tone. Approximately one-half hour before this condition, the audible alarm begins to beep periodically.
3. If the instrument's methane sensor should malfunction, the monitor will go into a failure mode similar to the low battery failure mode. The word "FAULT" will appear in the lower left corner of this display, and the audible alarm will sound a continuous tone.

#### **B. Tests for carbon monoxide/methane/oxygen:**

1. When activated, the CMX 270 detects and measures concentrations of carbon monoxide, methane, and oxygen in ambient air continuously and simultaneously. Also, when activated, the instrument will automatically reveal the oxygen content on the digital LCD. Since the Contest rules require the oxygen deficiency tests to be made last, the instrument should be put into a different readout mode before tests at the gas box are made.
2. All gas measurements are revealed in the digital LCD. The type of readout desired is selected by activating one of three touch type switches on the front of the case.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane is percent by volume, and oxygen is percent by volume.

### **MSA Passport Personal Alarm**

#### **A. Checking instrument:**

1. Turn the instrument on by pressing the On/Off button on the control face panel. (Battery pack should be secured to instrument prior to starting the clock for working of the contest problem.) Visually inspect the digital display after it stabilizes.
2. Check the battery condition by pressing the page button. Battery condition and voltage will be displayed. BATT appears in the exposure display, alarm lights flash, and alarm sounds. After initial LOW warning, (instrument will function for only approximately 30 minutes more). The alarm sounds every five minutes until power is turned off or the battery condition is at VERY LOW level. Very low battery is no longer able to operate the instrument and unit shuts down automatically.
3. Visually check instrument for damage.

#### **B. Testing for carbon monoxide/methane/oxygen:**

1. When activated, MSA Passport detects and measures concentration of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

### **LTX 310 Multi-Gas Monitor**

#### **A. Checking instrument:**

1. Turn the instrument on by pressing the On/Off button on the control face panel. The HOLD screen appears and the instrument sounds a beep approximately once a second. Continue holding the On/Off key until the RELEASE screen appears.

2. The following start-up screens will be displayed.

DISPLAY TEST - All segments of the display are activated to verify proper operation.

BATTERY TEST - The battery charge condition is displayed as either

NORMAL (at least eight hours of operation) or LOW (there may not be sufficient charge to operate the instrument for eight hours).

SENSOR CONFIGURATION - Displays the types of installed sensors.

3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, LTX 310 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

**TMX 410/412 Multi-Gas Monitor**

A. Checking instrument:

1. Turn the instrument on by loosening the finger nut at the base and rotate the calibration cover. Rock On/Off switch to the left. The four LED's will flash once and the instrument will emit a short beep.
2. The following start-up screens will be displayed.

DISPLAY TEST - All segments of the display are activated to verify proper operation.



BATTERY TEST - If the battery is not fully charged, the voltage reading will blink. When there is insufficient charge for the instrument to function properly, the display will read BATTERY FAIL (Instrument cannot be used).

SENSOR CONFIGURATION - Displays the types of installed sensors.

CODE - Normal startup continues without any operator response.

3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, TMX 410/412 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital LCD and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

### **CSE Explorer 4 Multi-Gas Monitor**

A. Checking instrument:

1. Turn the instrument on by pressing either key on the side of the instrument. The main menu will appear on the display.
2. Press the right key to select the main operate display. All installed gas sensors will be displayed.
3. Press the left key to display the battery charge condition.
4. Visually check the instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, Explorer 4 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.

2. All gas measurements are revealed on the digital display and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are measured and displayed in percent by volume.

### **ITX Multi-Gas Monitor**

#### **A. Checking instrument:**

1. Turn the instrument on by pressing the ON/OFF button on the control face panel for one beep. "Warm up" appears on the LCD.
2. Zero - Press (on/off mode) until "zero sensors" appears. Press "E" to start zeroing.
3. Peaks - Press (on/off mode) to view peaks. Press (E) to reset peaks.

Following start-up screen will display:

Sensor configuration - Displays the types of installed sensors.

Display test - All segments of the display are activated to verify proper operation.

Battery test. A battery status indicator is shown in the center of the display. As the instrument battery life is reduced, the shaded area of the battery indicator will clear until the instrument reaches the low battery condition. (24 hr. usage with full charge)

Visually check instrument for damage.

#### **B. Testing for carbon monoxide/methane/oxygen:**

1. When activated, ITX detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are measured and displayed in percent by volume.

## MSA Solaris

### A. Checking Instrument:

1. Turn the instrument on by pressing on/off button on the side of the instrument.
2. The following start-up screens will be displayed.

SELF TEST - All segments display, audible alarm sounds, alarm lights illuminate, vibrator activates, software version displays, along with internal diagnostics

ALARM SETPOINTS - Low, High, STEL(if activated), and TWA(if activated)

CALIBRATION GAS - Expected calibration gas values

TIME AND DATE - If data logging option installed

LAST CAL DATE - If data logging option installed

CAL DUE DATE - If data logging option installed

INSTRUMENT WARM-UP PERIOD

FRESH AIR SETUP OPTION

3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

### B. Testing for carbon monoxide/methane/oxygen:

1. When activated, MSA Solaris detects and measures concentrations of carbon monoxide, methane, and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

## **M40M Multi-Gas Monitor**

### **A. Checking instrument:**

1. Turn the instrument on by pressing the power button on the control face panel for one beep. This is the second button from the left and is the international symbol for power with a circle with a slash at the 12 o'clock position.
2. Zero - Press the up arrow (^) button once and "0" appears. Press the "Enter" button to start the zero process. This enter button is the third button from the left and is the international symbol for enter that is composed of a left descending arrow.
3. Peaks - Press the up arrow button (^) twice to view peaks. While viewing the peak readings press "Enter" to clear.

Following start-up screen, all the segments of the display illuminate to verify proper operation. This is followed by the software revision number. This in turn is followed by a 20 second count down timer. All installed sensors will then display.

A battery status indicator is shown in the lower left corner of the display. As the instrument battery life is reduced, the shaded area of the battery indicator will clear until the instrument reaches the low battery condition. (18 hr. usage with full charge)

Visually check instrument for damage.

### **B. Testing for carbon monoxide/methane/oxygen:**

1. When activated the M40M detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are measured and displayed in percent by volume.

## STATEMENTS OF FACT MINE RESCUE

1. Three elements must be present for an explosion to occur: fuel, oxygen, and heat (ignition). (Directorate MSHA 2105, p. 51)
2. Permanent seals should be well hitched in the roof, floor, and ribs to make them as airtight as possible. (MSHA 2105, p. 46)
3. Electrical fires are best extinguished by nonconducting agents such as carbon dioxide and certain dry chemicals. (MSHA 2105, pp. 8 & 21)
4. Under no circumstances should ventilation be altered without orders to do so from the command center. (MSHA 2103, p. 5)
5. "Class A" fires are best extinguished by cooling with water or by blanketing with certain dry chemicals. (MSHA 2105, p. 21)
6. The first priority of rescue and recovery operations is team safety. (MSHA 2104, p. 18)
7. The second priority of rescue and recovery operations is the rescue of survivors. (MSHA 2104, p. 18)
8. The third priority of rescue and recovery operations is the recovery of the mine. (MSHA 2104, p. 18)
9. A fresh-air base is established at the point where conditions no longer permit barefaced exploration. (MSHA 2104, p. 7)
10. Hydrogen can be liberated when water or steam comes in contact with hot carbon materials. (MSHA 2105, p. 31)
11. All conductive objects such as cables, track, trolley wire, water lines, belt structures, etc., extending into the explosion area should be severed or removed at or outby the fresh-air base before explorations are started. (MSHA 2104, p. 10 and MSHA 2105, pp. 45 & 47)
12. Explosions in coal mines are most often caused by ignitions of methane, coal dust, or a combination of the two. (MSHA 2105, p. 52)

13. An indication of an explosion may be a jump in the pressure recording chart for the main fan. (MSHA 2104, p. 54)
14. Gas readings must be taken in the returns near the fire area to determine if the mine atmosphere is potentially explosive. (MSHA 2105, p. 25)
15. Seals in high volatile coalbeds are often placed 1,000 feet or more from the fire area. (MSHA 2105, p. 37)
16. When sealing a mine fire, you should be careful to ensure that there are no abrupt changes in the ventilation over the fire area. (MSHA 2105, p. 42)
17. Copper tubes or pipes are inserted in temporary and permanent seals for the purpose of collecting air samples from the sealed area. (MSHA 2105, pp. 42 & 47)
18. Before going underground to explore for a fire or to fight a fire, the team should know about any possible ignition sources that may exist in the affected area. (MSHA 2105, p. 23)
19. The team should make sure the main fan is running, a guard is monitoring the operation of the fan, and that tests are being made at the main return for any gases that may be present in the mine, before they go underground. (MSHA 2105, p. 22)
20. Before a fresh-air base is advanced, gas tests should be made in all dead ends and high places between the old and new fresh-air base. (MSHA 2104, p. 15)
21. Your captain may order the team to return immediately to the fresh-air base if a team member's apparatus malfunctions. (MSHA 2104, p. 52)
22. In potentially explosive atmospheres, nonsparking tools, nails, and spads should be used. (MSHA 2104, p. 22)
23. When you have located a barricade, you should try to determine whether the miners inside are still alive and conscious. (MSHA 2106, p. 5)
24. Carbon monoxide is a product of incomplete combustion of any carbon material. (MSHA 2102, p. 35)

25. Opening of seals prematurely can cause a re-ignition of a fire or an explosion. (MSHA 2107, p. 5)
26. Specific gravity is the weight of a gas compared to an equal volume of normal air under the same temperature and pressure. (MSHA 2102, p. 13)
27. The explosive range of methane in air is 5 to 15 volume percent. (MSHA 2102, p. 31)
28. The lower explosive limit of hydrogen is 4.0 percent. (MSHA 2102, p. 67)
29. Acetylene is formed when methane is burned or heated in air having a low oxygen content. (MSHA 2102, p. 45)
30. Continual exposure to hydrogen sulfide may dull the sense of smell. (MSHA 2102, p. 41)
31. The specific gravity of methane is 0.5545. (MSHA 2102, p. 31)
32. The specific gravity of carbon dioxide is 1.5291. (MSHA 2102, p. 29)
33. The specific gravity of carbon monoxide is 0.9672. (MSHA 2102, p. 34)
34. Blackdamp is a mixture of carbon dioxide, nitrogen and air which is oxygen deficient. (MSHA 2102, p. 47)
35. Smoke usually contains carbon monoxide and other toxic or asphyxiating gases produced by fires. (MSHA 2102, p. 48)
36. Breathing air containing 10 percent carbon dioxide causes violent panting and can lead to death. (MSHA 2102, p. 29)
37. The first symptom of carbon monoxide poisoning is a slight tightening across the forehead and possibly a headache. (MSHA 2102, p. 35)
38. High temperatures (or heat) cause gases to expand so they diffuse more quickly. (MSHA 2102, p. 12)
39. It is much easier to remove a concentration of a light gas like methane by ventilation than it is to remove the same concentration of a heavier gas like carbon dioxide. (MSHA 2102, p. 14)

40. Small hydrogen explosions, known as hydrogen "pops" are fairly common in firefighting. (MSHA 2105, p. 31)
41. Explosions, fires, and other disasters frequently result in weakened roof and rib conditions. (MSHA 2107, p. 23)
42. Before a rescue team goes underground, it will attend a briefing session. (MSHA 2104, p. 23)
43. It is the responsibility of rescue team members to have all the information needed to do the work. (MSHA 2104, p. 23)
44. Regulators are used in mine ventilation to regulate airflow to meet the individual needs of each air split. (MSHA 2103, p. 20)
45. Overcasts are used to permit two air currents to cross without the intake air short circuiting to the return. (MSHA 2103, p. 18)
46. When reporting anything to the fresh-air base, be sure you are clearly and correctly identifying locations. (MSHA 2104, p. 48)
47. The lower explosive limit of carbon monoxide is 12.5 percent. (MSHA 2102, p.67)
48. The basic principle of mine ventilation is that air always moves from high to low pressure regions. (MSHA 2103, p. 7)
49. The most positive indicator of the origin of an explosion is the direction in which blocks have moved in or from stoppings across entries near intersections. (MSHA 2103, p. 26)
50. Coking or coke streamers, if encountered, should be reported in location and size. (MSHA 2104, p. 47)



# ***SECTION II***

## ***FIRST AID***

## 2005 FIRST AID CONTEST RULES

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#### Section II

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## **RULES GOVERNING THE 2005 NATIONAL FIRST AID CONTEST**

1. Members of First Aid Teams must be bona fide employees of the mining industry. All team members and patient shall be dressed alike. Shoes need not be identical. The patient may wear shorts even if the team members are wearing pants. The pants and shorts shall be the same color.
2. A team shall consist of three team members, one of which will be the patient. A team may use the same patient for multiple teams. The Contest Director must be notified when a patient will be used for multiple teams.
3. Trauma and artificial ventilation/cardiopulmonary resuscitation will be incorporated into the problem. The recording manikins for AV/CPR will be supplied by the teams and the printed tape will be used in part for determining discounts. At the completion of the problem, the taped performance will be removed from the manikin by the team member who performed AV/CPR, in the presence of a judge, and the team member will sign the tape and place his/her team number on it. The recorded tape discounts will be transferred to the AV/CPR scorecard.
4. If the problem requires a bystander, one will be provided by Contest Officials. Bystander(s) will be positioned at the field and will be identified as a bystander with labels or name tags.
5. All procedures shall be performed as outlined in the Rules Governing the 2005 First Aid Contest; Contest Skill Sheets; First Aid Book revised 1998 and the Interpretations of the Discount Card. The rules take precedence and supersede the First Aid Book.
6. Each team entering the contest will draw a number to determine the order of the performance at the time of registration. Teams sharing equipment must notify the registrar upon registration.
7. Each participating team must be under guard before the start of the contest. If any team or team members receive unauthorized information concerning a contest problem, the team shall be disqualified by the Chief Judge and Final Appeals Committee.
8. No practicing will be allowed on the field before the beginning of the Contest. No First Aid Books or training material or timing devices will be permitted in the working area. A CPR test tape will be requested prior to working the first problem.

9. Contest officials will designate spaces (15 feet by 15 feet) for teams to work. All equipment (except manikin) will be kept behind a baseline designated by a Contest Official. All problems will be worked in the designated area which shall contain only the judges and the contesting teams. The manikin will be located within the 15-foot by 15-foot designated space.
10. Any team or member receiving information concerning a Contest problem prior to arriving at the working area will be disqualified by the Chief Judge and Director.
11. Injuries/conditions requiring treatment will be identified by cards, envelopes or labels attached to the patient at or as near the location of the injury as possible on the outside of the clothing, be identified by simulated wounds, or be in the reading of the problem. Wounds that are listed in the reading of the problem shall also be placed on patient. (Exception: If the wound is on the eyelid or an impaled object in the eye, the label will NOT be placed on the eye, but in an obvious area near the eye.)

During the detailed physical exam, teams may find an envelope attached to the patient which contains patient information that needs immediate attention. Upon completion of treatment of these conditions, patient assessment will be resumed at the point where team left off. The patient will already be marked upon arrival of the team. (Shoes may already be removed and clothes loosened by the patient.)

Since spinal stabilization must be taken as outlined in Patient Assessment, spinal injuries will be stated in the reading of the problem and not marked on the patient. (Symptoms may be used.) Profuse bleeding and sucking chest wound shall be stated in the reading of the problem and shall be marked on the patient. (Symptoms may be used.)

12. Wording on the cards or labels will be exactly as listed in the 1998 First Aid Book, example: "3" WOUND ON BACK BETWEEN SHOULDER BLADES" not just 3" WOUND" and placed on the center of the back.
13. Lettering on the cards and/or labels will be at least 1/4-inch in height.

Example: **2-INCH WOUND ON FOREHEAD**

14. Contest officials will provide a timing device to be started by the team and a timing device for the Timekeeper. Upon entering the Contest field, the team and timekeeper will simultaneously start the timing devices.

15. Problems will be kept in unsealed envelopes, retained by the judges, and given to the team as soon as they start the clock.
16. The calculated time will be determined by Contest Officials by averaging the working time of all teams participating in the Contest (1 discount per 3 minutes overtime or fraction thereof).
17. After stopping the clock, the team will inform the judges that the patient is ready for inspection. Team members will remain with the patient until released by the judges.
18. In the event of ties in the contest, Scorecard A discounts will be the first tie breaker, Scorecard B (AV/CPR) discounts will be the second tie breaker and the third tie breaker will be the Team's actual working time.
19. Appeals

Upon completion of the examination of the patient, the team shall be informed of the infractions regarding treatment, but not the number of discounts. The team has the right of verbal appeal after being informed of the infractions. If the first appeal cannot be resolved by the field judges, the team may request an appeal from the Chief Judge, Assistant Chief Judge or his/her designee. If a team member displays unsportsmanlike conduct, the team's appeal will not be recognized.

During the verbal appeal process, all questionable dressing(s) shall remain intact until the appeal is resolved. If any questionable dressing(s) is removed or altered by the team prior to being resolved, the appeal shall not be allowed.

Teams will have 30 minutes, after being notified to report to Final Appeals. Upon reporting to Final Appeals, the team shall have 20 minutes for reviewing the Scorecards and preparing protests for each problem. The teams will receive each problem separately and will be given 20 minutes to review each problem. All protests shall be in writing and shall clearly state the team's comments to the discount in question, along with applicable rule and/or page number(s). All protests will be considered by the Final Appeals Committee, and a decision will be binding and final.

Under no circumstances will videotape recordings or photos be introduced as supplementary material for consideration of the appeal.

## MATERIALS LIST

Teams must supply their own first aid materials. Suggested minimum materials for First Aid Teams:

- Compliment of triangular bandages (sufficient to treat injuries as outlined in First Aid Book)
- Compliment of compresses
- Adhesive compresses (Band-aid)
- Assortment of gauze
- Roller gauze
- 2 Blankets
- Scissors
- 8 Pair latex gloves
- 3 Mask/ face shields or masks and goggles
- 2 Heated objects
- 2 Cold packs
- 2 Cups
- Pen and paper
- 3 Plastic bags - one gallon size
- Elevating device
- Recording manikin
- 2 Pocket masks with one-way valve
- White bag
- Compliment of splints (may be pre-padded but not assembled)
- Backboard splint appropriate for tying fractures/ dislocations as outlined in the First Aid Book, including 15 ties for spinal injury (backboard splints may be preassembled and padded)
- Air splints
- 1 Packet Sugar or 1 Sugar Cube
- Tape

## INTERPRETATIONS OF SCORECARD A

1. Materials other than those stated in the First Aid Book, Revised 1998 or the Minimum Materials List can not be used during the working of the contest. \_\_\_\_5
2. Violations of or failure to follow Rules Governing the 2004 National First Aid and CPR Contest. \_\_\_\_2 for each infraction
3. Protective equipment must be donned after starting the clock but prior to patient contact (gloves, masks, and eye protection - eyeglasses are acceptable). Bystanders, if used, shall be required to wear protective equipment. \_\_\_\_5 for each infraction
4. Gloves shall be changed if there would be contamination because of a glove tear or due to other contamination. \_\_\_\_2 for each infraction
5. The broken-back board splint may be preassembled and padded. Other splints may be prepped but not assembled. (Cravat bandages cannot be preassembled on the back board, except for tying padding.) \_\_\_\_5
6. All bandaging and padding material, except blankets and splints, shall be kept in boxes or kits until clock is started. \_\_\_\_10
7. When the team encounters arterial/profuse bleeding, no work other than controlling bleeding and dressing the wound shall be done until bleeding is controlled. Bleeding is controlled when the dressing for that wound is tied in place unless otherwise stated by the Judge. If the cover dressing has been started and the team member can complete that treatment, the other team member may continue to work. \_\_\_\_10 for each infraction
8. Treatment for a sucking chest wound shall be completed as outlined during Patient Assessment. \_\_\_\_10
9. All life-threatening conditions shall be located and started before Detailed Physical Examination can begin. \_\_\_\_5

Detailed Physical Examination can begin after all life-threatening conditions have been located and treatment started. (Example: Uncontrollable bleeding and sucking chest wound) Environmental and Medical Emergencies can be treated anytime during Detailed Physical Examination.

10. The bystander must be shown the correct method of support. \_\_\_\_ 2

A bystander shall be limited to assisting the team only in the area of taking support of fractures, dislocations, or spinal injuries (including maintaining an open airway in the event of a spinal injury and/or Two-Person Log Roll). The bystander must be shown the correct method of support and maintaining the open airway by a team member or members after the clock is started, but before taking support.

11. Each PROCEDURE shall be performed as identified on the skill sheets. \_\_\_\_5 for each infraction
12. Each CRITICAL SKILL shall be performed as identified on the skill sheets. \_\_\_\_1 for each infraction (not to exceed 5 discounts per Procedure)
13. The team member performing the Detailed Physical Examination must state the location and physically examine each condition found. \_\_\_\_ 2
14. Working out of order (assessment, procedure, critical skill). \_\_\_\_2

Teams will systematically conduct the Detailed Physical Examination according to procedure number seven of the patient assessment skill sheet. Each area of the body shall be examined in its entirety prior to treating injuries in that area (except taking support). All injuries must be treated on the area being examined prior to moving to the next area to be examined. The sling for fractured ribs may be applied after upper extremity has been surveyed/treated.

However, if treatment has been started and can be completed by one team member (except injuries requiring a backboard), the other team member may continue the examination to the next area and begin treatment. (Systematically, legs are treated before the arms.)

15. Fractures shall be supported prior to bandaging injuries. Once the extremity has been assessed, fractures must be supported prior to bandaging injuries on the extremity. \_\_\_\_5

During the Detailed Physical Examination, except for fractures of ribs, nose, and jaw, or dislocations of the fingers, toes, or jaw, teams must physically support/stabilize fractures and dislocations as they are found. When the fracture/dislocation is on an extremity and support has been taken, the team must complete the examination on the extremity treating other injuries prior to splinting the fracture/dislocation.



16. Treatment of injury shall be at proper location (example: treating right hand rather than left hand). \_\_\_\_5
17. All injuries and/or conditions shall be treated (example: wound, fracture, frostbite). \_\_\_\_10 for each infraction
18. Not applying sling for upper extremity wound. \_\_\_\_1

Triangular slings are required for all wounds of upper extremities, including shoulder and armpit wounds. Slings will not be required for upper extremity burns. However, if a burn and wound and/or fracture/dislocation are present on the same upper extremity, a sling shall be applied. Slings will be applied on upper extremities with injuries after all injuries of the extremity have been treated.

19. Support of fractures and/or dislocations shall not be broken or released. \_\_\_\_3

When changing support, if support is broken, this discount applies. Change of support can be done as many times as the team desires provided the support is not broken.

Support the fractured or dislocated elbow in a straight position until No. 4 bandage is tied.

Suspected spinal injuries will be supported until after the fifth bandage is tied on the backboard.

20. Support for upper extremity fractures/dislocations shall be maintained until the sling is completed. Discount if support of fracture and/or dislocation is released by support person before sling is completed. \_\_\_\_3
21. Splints and/or back-board splints shall be padded. \_\_\_\_1
22. Tight clothing at neck, chest, and waist shall be loosened. Clothing may be loosened by patient prior to the beginning of the contest. \_\_\_\_1
23. Patient cannot talk, direct, or assist unless stated in the problem. \_\_\_\_5 for each infraction
24. Handling patient in such a manner that could compromise condition of the patient. \_\_\_\_5 for each infraction

25. Failure to treat or improper treatment of shock. \_\_\_\_5

Prior to stopping the clock the patient must be treated for shock including elevation. Elevate lower extremities at least six inches when treating for shock except in the instance of skull fractures, heat stroke, heart attack, stroke or shortness of breath due to chest or throat injuries. In these instances the head and shoulders shall be elevated at least six inches.

26. Teams shall not pad around the head and neck of the patient, for a suspected spinal injury, before the patient is placed onto the backboard. \_\_\_\_ 1
27. Teams shall use square knots when tying bandages. \_\_\_\_1 (discount only one (1) point regardless of the number of ties that are not square knots)
28. Teams shall tuck the tails of all bandages. \_\_\_\_1 (discount only one (1) point regardless of the number of tails of bandages not tucked)
29. All material (except manikin) shall be placed behind baseline prior to stopping the clock. After completing the problem the work area shall be cleaned of ALL material (except manikin), including the infectious waste, which shall be placed in a white trash bag provided by the team. When all materials have been placed behind baseline, a team member shall stop the clock. The judges and First Aid team will verify the working time upon completion of the problem. \_\_\_\_1
30. Failure to follow written instructions. \_\_\_\_5

**INTERPRETATIONS OF SCORECARD B**  
**ARTIFICIAL VENTILATION/CARDIOPULMONARY RESUSCITATION**

1. Failure to determine unresponsiveness (according to Critical Skill Sheet). \_\_\_\_1
2. Failure to call for help. \_\_\_\_1
3. Failure to open airway. \_\_\_\_1
4. Failure to use proper maneuver to open airway (using head-tilt/chin-lift maneuver when jaw-thrust should be used, vice versa). \_\_\_\_1
5. Failure to assess breathlessness in 3-5 seconds. \_\_\_\_1
6. Failure to use one-way valve barrier device when ventilating manikin. \_\_\_\_1

7. Failure to give initial 2 breaths. \_\_\_\_1
  - a. Volume shall be at least .8 liters (through .7 liter line on new manikins). \_\_\_\_1
8. Failure to use mouth-to-nose ventilation when required. \_\_\_\_1
9. Failure to keep body and head in line, if spinal injury exists. \_\_\_\_1
10. Failure to use tongue jaw lift, cross-finger technique, or finger sweep when required. \_\_\_\_1
11. Failure to reposition head when airway obstruction is suspected. \_\_\_\_1
12. Failure to give abdominal thrusts or chest thrusts when required. \_\_\_\_1
13. Failure to check pulse prior to giving compressions. \_\_\_\_1
14. Failure to assess pulse for 5-10 seconds. \_\_\_\_1
15. Failure to correctly locate the carotid pulse. \_\_\_\_1
16. Failure to verbalize absence of pulse. \_\_\_\_1

### **Cardiopulmonary Resuscitation**

1. Failure to give AV/CPR when required. \_\_\_\_20
2. Failure to locate landmark for giving compressions. \_\_\_\_1
3. Failure to make parallel axis with heels of hands. \_\_\_\_1
4. Allowing fingers to rest on chest. \_\_\_\_1
5. Compressions. Discounts shall apply to each set.
  - a. Timing. 15 compressions shall be completed in 8-10 seconds. \_\_\_\_1
  - b. Depth. Compression depth shall be between the two lines for 60-80 pounds pressure. \_\_\_\_1
  - c. Number required. A total of 15 compressions shall be made each cycle. \_\_\_\_1
  - d. Release of upstroke. The release line shall be straight. \_\_\_\_1
  - e. Rate. Compressions shall be made at the rate of 100 per minute. \_\_\_\_1

6. Failure to maintain hand contact with manikin when releasing pressure during compressions. \_\_\_\_1
7. Failure to give 2 breaths between each cycle of compressions. \_\_\_\_1
  - a. Timing (not completing breaths and returning to compressions in 4-7 seconds (peak of last downstroke to peak of second ventilation). \_\_\_\_1
  - b. Volume shall be at least .8 liters (through .7 liter line on new manikins). \_\_\_\_1
8. Failure to give four cycles of 15 compressions and 2 breaths for each minute of CPR (point of first downstroke to peak of last breath). (A cycle is 15 compressions and two (2) ventilations. A set is 4 cycles.) \_\_\_\_1
9. Failure to assess pulse for 5-10 seconds after 1<sup>st</sup> minute of CPR. \_\_\_\_1
10. Failure to assess pulse for 3-5 seconds after three minutes of CPR. \_\_\_\_1
11. Failure to give five (5) abdominal thrusts when airway obstruction is suspected. \_\_\_\_1
12. Failure to perform CPR as stated in the problem. Too many or too few compressions can be detrimental to patient. \_\_\_\_1
13. Failure for the number of Rescuer/Rescuers to perform CPR as stated in the problem. Team performing One-Person CPR when Two-Person CPR is required and vice versa. \_\_\_\_3 (When problem states "Two-Rescuer CPR", two people are required to perform CPR as listed in Two-Rescuer CPR skill sheets.)
14. Failure to begin with compressions after pulse check is completed or when changing rescuers. \_\_\_\_1
15. Failure of rescuers to change positions in 10 seconds or less when performing two-person CPR. \_\_\_\_1
16. Failure of rescuer to make final pulse check when CPR is completed. \_\_\_\_1
17. Failure of rescuer to state that patient has a pulse when CPR is completed. \_\_\_\_1

### **Artificial Ventilation**

1. Failure to give artificial ventilation. \_\_\_\_\_ 20
2. Failure to give 10-12 breaths in each 58-62-second period. \_\_\_\_1
3. Failure to provide a breath volume of at least .8 liters (through .7 liter line on new manikins).\_\_\_\_\_ 1
4. Failure of rescuer to check for return of breathing and pulse when artificial ventilation is completed. \_\_\_\_\_1
5. Failure of rescuer to state that patient is breathing and has a pulse when artificial ventilation is completed. \_\_\_\_1

## PATIENT ASSESSMENT

PROCEDURES	CRITICAL SKILL
1. SCENE SAFETY	A. Observe area to ensure safety
2. MECHANISM OF INJURY	A. Determine causes of injury, if possible B. Ask patient what happened C. Call for help
3. INITIAL ASSESSMENT	A. Verbalize general impression of the patient B. Determine responsiveness/level of consciousness C. Determine chief complaint/apparent life threats
4. ASSESS AIRWAY AND BREATHING	A. Correctly execute head-tilt/chin-lift or jaw thrust maneuver, depending on the presence of C-spine injuries B. Look, listen, and feel C. Determine presence of breathing in 3-5 seconds
5. ASSESS CIRCULATION	A. Check carotid pulse B. If present, control arterial/profuse bleeding C. If present, treat sucking chest wound
6. DETERMINE PRIORITY OF PATIENT	A. Teams must make statement to judge, "Will transport as soon as possible" B. Teams must make statement to judge, "Removing clothing and exposing and cleaning wound surface"

7. DETAILED PHYSICAL EXAMINATION	<b>ENVIRONMENTAL AND MEDICAL EMERGENCIES CAN BE TREATED ANY TIME DURING DETAILED PHYSICAL EXAMINATION</b>
ASSESS:	
(a) HEAD	<ul style="list-style-type: none"> <li>A. Inspect and touch the scalp and ears</li> <li>B. Assess the eyes</li> <li>C. Assess the facial areas including oral and nasal areas</li> </ul>
(b) NECK	<ul style="list-style-type: none"> <li>A. Inspect and touch the neck</li> <li>B. Inspect for medical ID</li> </ul>
(c) CHEST	<ul style="list-style-type: none"> <li>A. Inspect for injury by touch</li> </ul>
(d) ABDOMEN	<ul style="list-style-type: none"> <li>A. Inspect for injury by touch (Verbally state inspection of crotch and buttocks areas)</li> </ul>
(e) PELVIS	<ul style="list-style-type: none"> <li>A. Inspect for injury by touch</li> </ul>
(f) LEGS	<ul style="list-style-type: none"> <li>A. Inspect for injury by touch (Verbally state inspection of groin area)</li> <li>B. Check for paralysis</li> <li>C. Check for medical ID bracelet</li> </ul>
(g) ARMS	<ul style="list-style-type: none"> <li>A. Inspect for injury by touch</li> <li>B. Check for paralysis</li> <li>C. Check for medical ID bracelet</li> </ul>
(h) BACK SURFACES	<ul style="list-style-type: none"> <li>A. Inspect for injury by touch</li> </ul>

**ONE-PERSON CPR (MANIKIN ONLY)**  
**AMERICAN HEART ASSOCIATION GUIDELINES**

PROCEDURES	CRITICAL SKILL
1. ESTABLISH UNRESPONSIVENESS	<ul style="list-style-type: none"> <li>A. Tap or gently shake shoulders</li> <li>B. Shout, "Are you OK?"</li> <li>C. Determine unconsciousness without compromising C-spine injury</li> <li>D. Say aloud, "Call for help"</li> </ul>
2. ESTABLISH AIRWAY	<ul style="list-style-type: none"> <li>A. Kneel at the patient's side near the head</li> <li>B. Correctly execute head-tilt/chin-lift or jaw thrust maneuver depending on the presence of C-spine injuries</li> </ul>
3. MONITOR PATIENT FOR BREATHING	<ul style="list-style-type: none"> <li>A. Look, listen, and feel for breathing</li> <li>B. Determine the absence of breathing in 3-5 Seconds</li> </ul>
4. VENTILATION PATIENT	<ul style="list-style-type: none"> <li>A. Place barrier device (pocket mask with one-way valve) on manikin</li> <li>B. Give 2 slow breaths (about 2 seconds each)</li> <li>C. Each breath - minimum of .8 liters (through .7 liter line on new manikins)</li> </ul>
5. PULSE CHECK	<ul style="list-style-type: none"> <li>A. Correctly locate the carotid pulse - on the side of the rescuer, locate the patient's windpipe with your index and middle fingers and slide your fingers in the groove between the windpipe and muscle in the neck</li> <li>B. Check for presence of carotid pulse for 5 to 10 seconds</li> <li>C. Verbalize absence of pulse</li> </ul>
6. POSITION FOR COMPRESSIONS	<ul style="list-style-type: none"> <li>A. Locate the compression point on the breastbone between the nipples</li> <li>B. Place the heel of one hand on the compression point and the other hand on top of the first so hands are parallel</li> <li>C. Do not rest fingers on the chest</li> <li>D. Keep heel of your hand on chest during and between compressions</li> </ul>
7. DELIVER CARDIAC COMPRESSION	<ul style="list-style-type: none"> <li>A. Give 15 compressions</li> <li>B. Compressions are at the rate of 100 per minute (15 compressions in 8-10 seconds)</li> <li>C. Downstroke for compression must be on or between compression lines</li> <li>D. Return to baseline on upstroke of compression</li> </ul>



8. VENTILATIONS BETWEEN COMPRESSIONS	<ul style="list-style-type: none"> <li>A. Give 2 slow breaths (about 2 seconds each)</li> <li>B. Each breath - minimum of .8 (through .7 liter line on new manikins)</li> <li>C. Complete breaths and return to compressions in 4-7 seconds (This will be measured from the end of last downstroke to the start of the first downstroke of the next cycle.)</li> </ul>
9. CONTINUE CPR FOR TIME STATED IN PROBLEM	<ul style="list-style-type: none"> <li>A. Provide 4 cycles of 15 chest compressions and 2 rescue breaths (about 1 minute)</li> <li>B. To check for pulse, stop chest compressions for 5-10 seconds after the first minute of CPR</li> <li>C. Rescuer opens airway and looks, listens, and feels for adequate breathing or coughing</li> <li>D. Rescuer checks for a carotid pulse</li> <li>E. If no signs of circulation are detected, continue chest compressions and breaths and check for signs of circulation every three minutes</li> <li>F. A maximum of 10 seconds will be allowed to complete ventilations and required pulse checks between sets (this will be measured from the end of the last downstroke to the start of the first downstroke of the next cycle)</li> </ul>
10. CHECK FOR RETURN OF PULSE	<ul style="list-style-type: none"> <li>A. After providing required CPR (outlined in problem), check for return of pulse (3-5 seconds)</li> <li>B. State "Patient has a pulse."</li> </ul>

**TWO-RESCUER CPR (NO SPINAL INJURY - MANIKIN ONLY)  
AMERICAN HEART ASSOCIATION GUIDELINES**

PROCEDURES	CRITICAL SKILL
1. RESCUER 1 - ESTABLISH UNRESPONSIVENESS	A. Tap or gently shake shoulders B. Shout, "Are you OK?" C. Determine unconsciousness without compromising C-spine injury D. Say aloud, "Call for help"
2. RESCUER 1 - ESTABLISH AIRWAY	A. Kneel at the patient's side near the head B. Correctly execute head-tilt/chin-lift maneuver
3. RESCUER 1 - MONITOR PATIENT FOR BREATHING	A. Look, listen, and feel for breathing B. Determine the absence of breathing in 3-5 Seconds
4. RESCUER 1 - VENTILATE PATIENT	A. Place barrier device (pocket mask with one-way valve) on manikin B. Give 2 slow breaths (about 2 seconds each) C. Each breath - minimum of .8 (through .7 liter line on new manikins)
5. RESCUER 1 - CHECK FOR CAROTID PULSE	A. Correctly locate the carotid pulse - on the side of the rescuer, locate the patient's windpipe with your index and middle fingers and slide your fingers in the groove between the windpipe and the muscle in the neck B. Check for presence of carotid pulse for 5 to 10 seconds C. Verbalize absence of pulse
6. RESCUER 2 - POSITION FOR COMPRESSIONS	A. Locate the compression point on the breastbone between the nipples Place the heel of one hand on the compression point and the other hand on top of the first so hands are parallel B. Do not rest fingers on the chest C. Keep heel of your hand on chest during and between compressions
7. RESCUER 2 - DELIVER CARDIAC COMPRESSION	A. Give 15 compressions B. Compressions are at the rate of 100 per minute (15 compressions in 8-10 seconds) C. Downstroke for compression must be on or between compression lines D. Return to baseline on upstroke of compression

8. RESCUER 1 - VENTILATIONS BETWEEN COMPRESSIONS	<ul style="list-style-type: none"> <li>A. Give 2 slow breaths (about 2 seconds each)</li> <li>B. Each breath - minimum of .8 (through .7 liter line on new manikins)</li> <li>C. Complete breaths and return to compressions in 4-7 seconds (This will be measured from the end of last downstroke to the start of the first downstroke of the next cycle.)</li> </ul>
9. CONTINUE CPR FOR TIME STATED IN PROBLEM	<ul style="list-style-type: none"> <li>A. Provide 4 cycles of 15 chest compressions and 2 rescue breaths (about 1 minute)</li> <li>B. To check for pulse, stop chest compressions for 5-10 seconds after the first minute of CPR</li> <li>C. Rescuer at patient's head maintains airway and looks, listens, and feels for adequate breathing or coughing</li> <li>D. The rescuer at the patient's head shall feel for a carotid pulse</li> <li>E. If no signs of circulation are detected, continue chest compressions and breaths and check for signs of circulation every three minutes</li> <li>F. A maximum of 10 seconds will be allowed to complete ventilations and required pulse checks between sets (this will be measured from the end of the last downstroke to the start of the first downstroke of the next cycle)</li> </ul>
10. CHANGING RESCUERS	<ul style="list-style-type: none"> <li>A. Change of rescuers shall be made in 10 seconds or less and will be completed as outlined in the problem</li> </ul>
11. CHECK FOR RETURN OF PULSE	<ul style="list-style-type: none"> <li>A. After providing required CPR (outlined in problem), check for return of pulse (3-5 seconds)</li> <li>B. State "Patient has a pulse."</li> </ul>

**TWO-RESCUER CPR (WITH SPINAL INJURY - MANIKIN ONLY)**  
**AMERICAN HEART ASSOCIATION GUIDELINES**

PROCEDURES	CRITICAL SKILL
1. RESCUER 1 - ESTABLISH UNRESPONSIVENESS	A. Tap or gently shake shoulders B. Shout, "Are you OK?" C. Determine unconsciousness without compromising C-spine injury D. Say aloud, "Call for help"
2. RESCUER 2 - ESTABLISH AIRWAY	A. Kneel at the patient's head B. Correctly execute jaw thrust maneuver
3. RESCUER 1 - MONITOR PATIENT FOR BREATHING	A. Look, listen, and feel for breathing B. Determine the absence of breathing in 3-5 seconds
4. RESCUER 2 - VENTILATE PATIENT	A. Rescuer 1 should place barrier device (pocket mask with one-way valve) on manikin. (OPTION 1: When spinal injury is present, Rescuer No. 2 can hold barrier device on manikin after Rescuer No. 1 correctly places the device over the mouth and nose.) (OPTION 2: Rescuer 1 can place the device on the manikin each time patient is ventilated) B. Rescuer 2 gives 2 slow breaths (about 2 seconds each) C. Each breath - minimum of .8 (through .7 liter line on new manikins)
5. RESCUER 1 - CHECK FOR CAROTID PULSE	A. Correctly locate the carotid pulse - on the side of the rescuer, locate the patient's windpipe with your index and middle fingers and slide your fingers in the groove between the windpipe and the muscle in the neck B. Check for presence of carotid pulse for 5 to 10 seconds C. Verbalize absence of pulse
6. RESCUER 1 - POSITION FOR COMPRESSIONS	A. Locate the compression point on the breastbone between the nipples B. Place the heel of one hand on sternum the compression point and the other hand on top of the first so hands are parallel C. Do not rest fingers on the chest D. Keep heel of your hand on chest during and between compressions

7. RESCUER 1 - DELIVER CARDIAC COMPRESSION	<ul style="list-style-type: none"> <li>A. Give 15 compressions</li> <li>B. Compressions are at the rate of 100 per minute (15 compressions in 8-10 seconds)</li> <li>C. Downstroke for compression must be on or between compression lines</li> <li>D. Return to baseline on upstroke of compression</li> </ul>
8. RESCUER 2 - VENTILATIONS BETWEEN COMPRESSIONS	<ul style="list-style-type: none"> <li>A. Give 2 slow breaths (about 2 seconds each)</li> <li>B. Each breath - minimum of .8 (through .7 liter line on new manikins)</li> <li>C. Complete breaths and return to compressions in 4-7 seconds (This will be measured from the end of last downstroke to the start of the first downstroke of the next cycle.)</li> </ul>
9. CONTINUE CPR FOR TIME STATED IN PROBLEM	<ul style="list-style-type: none"> <li>A. Provide 4 cycles of 15 chest compressions and 2 rescue breaths (about 1 minute)</li> <li>B. To check pulse, stop chest compressions for 10 seconds after the first minute of CPR</li> <li>C. Rescuer at patient's head maintains airway and looks, listens, and feels for adequate breathing or coughing</li> <li>D. The rescuer giving compressions shall feel for a carotid pulse</li> <li>E. If no signs of circulation are detected, continue chest compressions and breaths and check for signs of circulation every three minutes</li> <li>F. A maximum of 10 seconds will be allowed to complete ventilations and required pulse checks between sets (this will be measured from the end of the last downstroke to the start of the first downstroke of the next cycle)</li> </ul>
10. CHANGING RESCUERS	<ul style="list-style-type: none"> <li>A. Change of rescuers shall be made in 10 seconds or less and will be completed as outlined in problem</li> </ul>
11. CHECK FOR RETURN OF PULSE	<ul style="list-style-type: none"> <li>A. A final pulse check (3-5 seconds) will be required at the end of the last set of CPR</li> <li>B. State "Patient has a pulse."</li> </ul>

## MOUTH-TO-MASK RESUSCITATION

PROCEDURES	CRITICAL SKILL
1. ESTABLISH UNRESPONSIVENESS	<ul style="list-style-type: none"> <li>A. Tap or gently shake shoulders</li> <li>B. Shout, "Are you OK?"</li> <li>C. Determine unconsciousness without compromising C-spine injury</li> <li>D. Say aloud, "Call for help"</li> </ul>
2. ESTABLISH AIRWAY	<ul style="list-style-type: none"> <li>A. Correctly execute head-tilt/chin-lift or jaw thrust maneuver depending on the presence of C-spine injuries</li> </ul>
3. MONITOR PATIENT FOR BREATHING	<ul style="list-style-type: none"> <li>A. Look, listen, and feel for breathing</li> <li>B. Determine the absence of breathing in 3-5 seconds</li> </ul>
4. VENTILATE PATIENT	<ul style="list-style-type: none"> <li>A. Place barrier device (pocket mask with one-way valve) on manikin</li> <li>B. Ventilate patient 2 times at 1.5-2 second intervals each - minimum of .8 (through .7 liter line on new manikins)</li> </ul>
5. CHECK FOR CAROTID PULSE	<ul style="list-style-type: none"> <li>A. Correctly locate the carotid pulse (on the side of the rescuer)</li> <li>B. Check for presence of carotid pulse for 5 to 10 seconds</li> <li>C. Verbalize presence of pulse</li> </ul>
6. VENTILATE PATIENT	<ul style="list-style-type: none"> <li>A. Place barrier device (pocket mask with one-way valve on manikin</li> <li>B. Ventilate patient 10 to 12 times per minute. Each ventilation will be provided at a minimum of .8 (through .7 liter line on new manikins)</li> </ul>
7. CHECK FOR RETURN OF BREATHING AND PULSE	<ul style="list-style-type: none"> <li>A. After providing the required number of breaths (outlined in problem), check for return of breathing and carotid pulse for 3 to 5 seconds</li> <li>B. State "Patient is breathing and has a pulse"</li> </ul>

**AIRWAY OBSTRUCTION (MANIKIN ONLY)  
(UNCONSCIOUS PATIENT - UNWITNESSED)**

PROCEDURES	CRITICAL SKILL
1. ESTABLISH UNRESPONSIVENESS	<ul style="list-style-type: none"> <li>A. Tap or gently shake shoulders</li> <li>B. Shout, "Are you OK?"</li> <li>C. Determine unconsciousness</li> <li>D. Say aloud, "Call for help"</li> </ul>
2. ESTABLISH AIRWAY	<ul style="list-style-type: none"> <li>A. Correctly execute head-tilt/chin-lift or jaw thrust maneuver depending on the presence of C-spine injuries</li> </ul>
3. MONITOR PATIENT FOR BREATHING	<ul style="list-style-type: none"> <li>A. Look, listen, and feel for breathing</li> <li>B. Determine the absence of breathing in 3-5 seconds</li> </ul>
4. ATTEMPT VENTILATION	<ul style="list-style-type: none"> <li>A. Place barrier device on manikin</li> <li>B. Attempt to give slow full breath</li> <li>C. Identify there is an obstruction</li> </ul>
5. CHECK POSITIONING	<ul style="list-style-type: none"> <li>A. Reestablish airway using correct method and procedure</li> <li>B. Identify continued presence of the obstruction by re-attempting to ventilate</li> </ul>
6. DELIVER ABDOMINAL THRUST	<ul style="list-style-type: none"> <li>A. Straddle the patient's thighs</li> <li>B. Place heel of one hand against the patient's abdomen, midline slightly above the navel and well below xiphoid</li> <li>C. Place second hand on top of first</li> <li>D. Deliver quick upward thrust</li> <li>E. Each thrust administered with intention of relieving obstruction</li> <li>F. Deliver 5 thrusts</li> <li>G. Follow with opening mouth and finger sweep</li> <li>H. Attempt artificial ventilation</li> <li>I. Repeat the procedures until obstruction is cleared</li> </ul>

## ARTERIAL/PROFUSE BLEEDING

PROCEDURES	CRITICAL SKILL
1. DIRECT PRESSURE AND ELEVATION	A. Apply sterile dressing to wound B. Apply direct pressure C. Elevate the extremity except when spinal injury exists D. Tie pressure bandage in place
2. IF NOTIFIED THAT BLEEDING IS NOT CONTROLLED, PRESSURE POINTS SHALL BE UTILIZED	A. Apply pressure to appropriate pressure point and notify judge verbally that bleeding is controlled
3. DRESSING	A. Apply cover bandage



## SUCKING CHEST WOUND

PROCEDURES	CRITICAL SKILL
1. IMMEDIATELY COVER WOUND	A. Place nonporous material (gloved hand, plastic wrap, etc.) over wound
2. COMPRESS FOR WOUND ON SIDE OF CHEST OR WOUND IN CENTER CHEST	<p>A. If wound is in center of chest between shoulder blades, place the compress bandage over the nonporous material, and place the pad of the compress over the wound so that the ends are diagonally across the chest or back. Carry one end over the shoulder and under the armpit. Carry the other end under the armpit and over the shoulder. Tie the ends over the compress.</p> <p>B. If wound is on side of chest or center of chest not between shoulder blades, place a compress over the nonporous material and tie on opposite side.</p>
3. COVER DRESSING CANNOT BE APPLIED UNTIL DETAILED PHYSICAL EXAMINATION	<p><b>Apply proper cover dressing for location of injury</b></p> <p>Cover Dressing for Center of Chest between shoulder blades:</p> <p>A. Place the center of the base of a triangular bandage at the lower part of the neck</p> <p>B. Allow the apex to drop over the chest</p> <p>C. Carry the ends over the shoulders and under the armpits to the center of the chest</p> <p>D. Tie with the apex below the knot</p> <p>E. Turn the apex up and tuck it over the knot</p> <p>Cover Dressing for Chest:</p> <p>A. Cover with a proper size cravat by placing the center of the bandage on the side nearest the injury</p> <p>B. Take the ends across the back and abdomen or chest and tie on the opposite side</p>

## BANDAGING OPEN WOUNDS

PROCEDURES	CRITICAL SKILL
1. APPLY DRESSING/BANDAGE AS OUTLINED IN THE FIRST AID BOOK FOR SELECTED INJURY	THIS SECTION OF THE CRITICAL SKILLS WILL OUTLINE THE BANDAGING PROCEDURES FOR THE WOUNDS SELECTED FOR THE CONTEST FROM THE REVISED 1998 MSHA FIRST AID BOOK. Each bullet is a critical skill - 1 discount each.
2. BANDAGING PRINCIPLES	A. Cover entire wound B. Do not bandage too tightly C. Do not bandage too loosely D. Do not leave loose ends E. Cover all edges of dressing F. Do not cover the tips of fingers and toes when appropriate

## CARE OF FRACTURES AND DISLOCATIONS

PROCEDURES	CRITICAL SKILL
1. GENERAL PRINCIPLES	<ul style="list-style-type: none"><li>A. Take support immediately (if required) upon discovery of fracture/dislocation</li><li>B. Do not attempt to push bones back through open wound</li><li>C. Do not attempt to straighten fracture/dislocation</li><li>D. All injuries on the extremity shall be dressed and bandaged before work on splinting is begun</li></ul>
2. APPLY SPLINT AS OUTLINED IN 1998 MSHA FIRST AID MANUAL FOR SELECTED INJURY	<ul style="list-style-type: none"><li>A. THIS SECTION OF THE CRITICAL SKILLS WILL OUTLINE THE CARE OF FRACTURES/DISLOCATIONS OF INJURIES SELECTED FOR THE CONTEST FROM THE REVISED 1998 MSHA FIRST AID BOOK. Each bullet is a critical skill - 1 discount each.</li></ul>

## TWO-PERSON LOG ROLL

PROCEDURES	CRITICAL SKILL
1. STABILIZE HEAD	A. Stabilize the head and neck
2. PREPARING THE PATIENT	A. Place board parallel to the patient B. Kneel at the patient's shoulders opposite the board leaving room to roll the patient toward knees Raise the patient's arm, if not injured (the one closer to the rescuer) above the patient's head
3. PREPARING THE RESCUER	A. Grasp the patient at the shoulder and pelvis area B. Give instructions to bystander, if used to support
4. ROLLING THE PATIENT	A. While stabilizing the head, roll the patient toward the rescuer by pulling steadily and evenly at the shoulder and pelvis areas B. The head and neck should remain on the same plane as the torso C. Maintain stability by holding patient with one hand and placing board with other D. Roll the body as a unit onto the board (board may be slanted or flat) E. Place the arm alongside the body
5. SECURING PATIENT TO BOARD	A. Secure patient's head to backboard when required B. If suspected spinal injury exists, maintain support of the patient's head until the fifth bandage is tied on the back board. Other fractures and dislocations requiring a back board shall be supported as outlined in the 1998 First Aid Book until back board ties are completed. C. Tie the wrists together unless injury prevents

***SECTION III***

***BENCH***

***BG-174A***

2005 BENCH BG-174A CONTEST RULES

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## **RULES GOVERNING 2005 BENCH BG-174A CONTEST AND INTERPRETATIONS OF DISCOUNT CARDS**

1. Each participant must be under guard before the start of the Contest in a location assigned by the Chief Judge and must remain continuously under guard until time to work the problem. Participants under guard must be in a location where they will be unable to obtain any information concerning the problem to be worked. Any participant receiving information concerning a Contest problem prior to starting to work the problem will be disqualified by the Chief Judge and the Assistant Chief Judge. No person, except guards and Contest officials assigned to give the written examination, will be allowed to communicate with any participant under guard. Those who have performed will not be permitted to communicate with any participant awaiting their turn to perform.
2. Any indication of receiving unauthorized information during the working of the problem may result in disqualification as determined by the Chief Judge and the Assistant Chief Judge. No one except judges, Contest officials, and working participants will be permitted in the work area, unless special approval is given by the Chief Judge. Communication with bench participants, except for the judges, is prohibited. News media and photographers who wish to be in the working area must receive permission from the Director and be accompanied by a Contest official.
3. Any bench participant not in place and ready at the time specified will be disqualified from the Contest.
4. The bench participant will be provided with two BG-174A apparatuses (one disassembled, one assembled), an RZ-25 tester, a stopwatch, defogging solution, leak detector fluid and a tool kit. The work at the bench will consist of (1) a visual examination of a disassembled BG-174A and the proper assembly and preparation for use in rescue work. This will include correcting any predetermined problem(s) so that the apparatus is in proper working order. Simulating defogging of the facepiece lens will be done as part of the visual examination. This visual examination, correcting predetermined problem(s), and proper assembly can be done at any time allowed for working of the problem. (2) Test the assembled BG-174A apparatus with a RZ-25 tester, and correct the predetermined problem(s) so that the apparatus is in proper working condition. Except for removing the test cap from the breathing hoses at the double socket connection, the assembled BG-174A apparatus cannot be disassembled to look for problems, until the hoses are

attached to the RZ-25 tester. When testing is completed on the assembled BG-174A apparatus, the hoses shall be removed from the tester, connected to the facepiece, and the back cover installed. This shall be done before the clock is stopped.

5. Spare parts to correct the predetermined problem(s) will be provided once the bench participant has specifically identified the problem. This will require the participant to point out the exact location of the deficiency. (Example: Positive pressure leak in the breathing bag. Participant will identify the location of the hole.)
6. When an unplanned deficiency is encountered with the apparatus, the participant will be notified by the judges that the deficiency is not part of the problem. The judge will stop the clock, and any time used to correct the deficiency will not be charged to the working time. However, the process of verbal elimination shall not be used by the bench participant to find the predetermined problem(s). If it becomes obvious to the judges that this is occurring, the first offense will result in a warning, the second offense a discount, and the third offense could result in disqualification as determined by the Chief Judge. (Example: Participant verbally identifies a deficiency with every part of the facepiece when only one predetermined problem exists.)
7. The bench participant will not be allowed to bring any materials, written information, or records to the work site. The participant will not have to create a test record; however, he or she may write the test from memory on paper that will be provided for that purpose after the official working time has started.
8. Tests will be performed in sequence on the assembled BG-174A apparatus using the standard test procedures with the RZ-25 tester as outlined in the Draeger Safety BG-174A Test, Maintenance and Troubleshooting Manual (February 1999, edition).
9. A maximum of 30 minutes will be allowed to complete the problem. The bench judge will inform the participant when he has one minute remaining to work the problem. At the completion of the problem, the judge(s) and the participant will note the working time of the problem with the official timekeeper. Work done after the clock is stopped will not be recognized.



10. Manually abusing or intentionally over or under pressurizing the RZ-25 tester substantially will be considered abusing the equipment. If the participant is observed abusing the RZ-25 tester, the first offense will result in a warning, the second offense will result in a discount, and the third offense could result in disqualification as determined by the Chief Judge.

A. Written Examination of Bench Participant

1. The written examination shall consist of 30 questions. Twenty questions for the written examination will be taken verbatim from the Statements of Fact which will be fill in the blank and each blank shall represent a key word with no more than three blanks per statement. Ten questions will be taken verbatim from identification of parts. Thirty minutes will be allowed for the written examination.
2. In special circumstances, individual bench participants may be given oral instead of written examinations by at least two judges. Requests for consideration shall be presented to the Director of the Contest at the time of registration.
3. Bench participants will be separated to the extent possible, and every effort will be made to prohibit discussion of questions and answers among the bench participants.

B. Miscellaneous

1. In the event of ties in the Bench Contest, the number of discounts at bench will be the first tie breaker; the number of discounts on written examination will be the second tie breaker; and the official working time at bench in minutes and seconds will be the third tie breaker.
2. The bench participant and trainer will report to a designated location to review and prepare protests within one hour of notification. Twenty minutes will be given to review and prepare written protests. All protests will be considered by the Chief Judge and his/her Assistant and their decision will be binding.
3. Bench participants must be bonafide employees of the mining industry or members of mine rescue teams designated to fulfill the requirements of 30 CFR Part 49. This does not exclude bench participants whose team is not participating at the National Contest.

4. Disputes with regard to the Bench Contest (except discounts), shall be immediately filed with the Director. Disputes filed shall be in writing and set forth incidents, times, names source of information and act complained against. Complainant shall remain accessible to the Director until the complaint is resolved. A decision by the Director shall be final.

### Interpretations of Discount Sheet

#### A. Written Examination

1. For each incorrect answer\_\_\_\_\_1

#### B. Time

The time will be recorded in minutes and seconds.

#### C. Competition at Bench

1. Failure to verbally identify each test being conducted\_\_\_\_\_2

Verbally identify each test being performed.

2. Failure to verbally identify each problem\_\_\_\_\_5

Failure to verbally identify is also interpreted as failure to find the problem.

3. Failure to correct each problem\_\_\_\_\_5

The bench participant shall properly correct the problem and continue with the proper tests. Once a bench participant finds a predetermined problem and does not correct it before continuing with the remaining tests, he/she shall receive a five point discount for continuing without correcting the problem and a pending five point discount for failing to correct the problem. If all of the remaining tests are properly conducted and passed and the participant returns to the uncorrected problem and corrects it, the pending five point discount will not be assessed. Should the participant continue on from this point and

properly conduct all of the remaining tests again, he/she would also have the original five point discount for continuing tests removed.

4. Failure to conduct any visual examination or test on the BG-174A, each test\_\_\_\_\_5
5. Failure to tighten connections properly during assembly or testing, each connection\_\_\_\_\_1

All connections must be tightened on the apparatus and verbally identified as hand tight or wrench tight at the time the connection is tightened. Failure to verbally identify at the time the connection is being tightened will result in a one point discount for each. Zero adjustments shall be made on RZ tester prior to connecting the breathing hoses to the RZ-25 tester.

This includes:

- .Hose adapter on the RZ-25 - hand tight
- .Screw ring cover on lung demand valve assembly - hand tight
- .Absorbing cartridge connections - hand tight
- .Plug on training canister (if applicable) - wrench tight
- .Breathing bag - hand tight
- .Supplementary oxygen line connection at lung demand valve - hand tight
- .Pre-flush/dosage line connection - hand tight
- .Cylinder connections - hand tight
- .Locking screw on saliva trap - wrench tight
- .Breathing hoses (once testing has begun or during the visual examination on the disassembled apparatus) - hand tight

Once the zero adjustment on the tester has been made, do not readjust setting for balance of tests.

6. Failure to comply with rules not covered in discount sheet, each infraction\_\_\_\_\_2

If the discount is not listed on the discount sheet, and if it is not covered under one of the approved rules of the Contest, do not improvise a discount to cover the suspected violation.

D. Visuals

1. Failure to conduct a proper visual examination of the frame/harness\_\_\_\_\_1

The visual examination will include an examination of the harness assembly, frame, back cover, visible sealing rings, external gage, O<sub>2</sub> regulator, and warning whistle. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

2. Failure to conduct a proper visual examination of the breathing bag\_\_\_\_\_1

The participant will verbally identify that the breathing bag is being examined for pliability and signs of deterioration. Stretching or manipulating the breathing bag with a massaging action will be part of this examination. The participant will verbally identify that the o-ring and sealing rings are being examined for signs of deterioration. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 2 points)

3. Failure to conduct a proper visual examination of the O<sub>2</sub> cylinder\_\_\_\_\_1

A proper cylinder examination includes a visual inspection of the cylinder. The participant will verbally identify the cylinder pressure on the gage, the pressure rating on cylinder, the hydrostatic test date, and identify if the cylinder is plus rated. Participant will inform the judge if the cylinder pressure is less than 1,400 PSI. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

4. Failure to conduct a proper visual examination of the regenerative canister\_\_\_\_\_1

A proper examination includes a visual inspection for dents and defects. If a factory packed canister is used, verbally identify that the seal(s) is/are in place, and identify the expiration date with month and year. If a training canister is used, only the visual inspection for dents

and defects is required. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 3 points)

5. Failure to conduct a proper visual examination of the facepiece\_\_\_\_\_1

The visual examination will include an examination of the head strap assembly, mask body (including sealing edges), the lens, speaking diaphragm, wiper, and neck strap. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

6. Failure to conduct a proper visual examination of the hoses\_\_\_\_\_1

The participant will verbally identify that the hoses are being inspected for pliability and signs of deterioration. Stretching or manipulating the hoses with a massaging action will be part of this examination. The participant will verbally identify that the o-rings and sealing rings, including the sealing ring on the saliva trap, are being examined for signs of deterioration. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 2 points)

E. RZ-25 Tester

1. Failure to conduct the proper exhalation valve test\_\_\_\_\_2

Cap off exhalation hose and connect inhalation hose to exhalation valve connection on apparatus. Set RZ-25 tester on negative pressure pumping, gently activate bellows, and watch breathing bag. If valve is operating properly, bag should not begin to deflate after five seconds.

2. Failure to conduct a proper inhalation valve test\_\_\_\_\_2

Remove hose from exhalation valve and connect to inhalation valve. Set RZ-25 tester on positive pressure pumping, gently activate bellows and watch breathing bag. If valve is operating properly, bag should not begin to inflate after five seconds.

3. Failure to conduct a proper relief valve test\_\_\_\_\_2

Remove cap from exhalation hose and connect to apparatus. The RZ-25 tester is set on positive pressure pumping. Activate bellows and listen

for opening of relief valve once breathing bag is full. Valve should open between +10 mm H<sub>2</sub>O (+1 mbar) and +40 mm H<sub>2</sub>O (+4 mbar). Participant will verbally identify reading of opening of valve. This indication can also be felt by wetting skin between index and middle finger and holding in front of hole in relief valve cover.

NOTE: A more precise test of opening pressure for relief valve can be made by opening cylinder valve (with tester set on negative pressure pumping) and setting tester on leak test. Flow of oxygen from constant dosage will cause relief valve to open with opening pressure indicated on tester gage. If this alternative test is used, it must be done after the completion of the preflush/pressure gage equalization test.

4. Failure to conduct a proper positive pressure leak test\_\_\_\_\_2

Set RZ-25 tester on positive pressure pumping. Plug opening in pressure relief valve cover and warning whistle. Activate bellows until needle on tester reads +100 mm H<sub>2</sub>O or +10 mbar. Switch to leak test. Bleed needle down to +70 mm H<sub>2</sub>O or +7 mbar and start stopwatch. Needle should not drop more than 10 mm or 1 mbar in 60 seconds. (Other work can be done during this time.)

5. Failure to conduct a proper negative pressure leak test\_\_\_\_\_2

Remove plug from relief valve cover. Set tester on negative pressure pumping and activate bellows until needle on tester reads -100 mm H<sub>2</sub>O or -10 mbar. Switch to leak test. Bleed needle up to -70 mm H<sub>2</sub>O or -7 mbar and start stopwatch. Needle should not rise more than 10 mm H<sub>2</sub>O or 1 mbar in 60 seconds. Remove whistle cover after test. (Other work can be done during this time.) Participant may use his/her hand to assist in deflating the bag.

6. Failure to conduct a proper pre-flush/pressure gage equalization test\_\_\_\_\_2

Remove whistle cover from warning whistle. Set tester on negative pressure pumping. Open cylinder valve and watch breathing bag. Bag should completely inflate and there should be a short chirp of the whistle. Cylinder gage and external pressure gage should equalize to within +10 percent of each other. The participant will verbally identify the reading of the cylinder gage and the external pressure gage.

7. Failure to conduct a proper breathing bag volume test\_\_\_\_\_2

Set RZ-25 tester on negative pressure pumping. With breathing bag full, activate bellows and listen for lung demand valve opening. Valve should not open before tenth stroke of bellows.

8. Failure to conduct a proper lung demand valve test\_\_\_\_\_2

Set RZ-25 tester on negative pressure pumping and open cylinder valve. Activate bellows and listen for lung demand valve opening. Valve should open between -10 mm H<sub>2</sub>O (-1 mbar) and -40 mm H<sub>2</sub>O (-4 mbar). Participant will verbally identify reading of opening of valve.

9. Failure to conduct a proper constant dosage/bypass test\_\_\_\_\_2

Deflate breathing bag. Set RZ-25 tester to red dosage and plug pressure relief valve cover. Activate bypass valve and listen for flow of oxygen into the circuit as bag inflates. Release bypass button when needle has reached 1.7 LPM on the outside red scale. Remove plug from relief valve after test. Participant will verbally identify final reading.

10. Failure to conduct a proper whistle activation test\_\_\_\_\_2

Close cylinder valve and watch external pressure gage. Whistle should activate at approximately 700 PSI for a four hour apparatus. Participant will verbally identify reading when whistle was activated. (The participant may use the manual bypass valve to bleed down the gage, but must release the valve before the whistle is activated.)

11. Failure to conduct a proper whistle duration manual cut-off test\_\_\_\_\_2

Lift manual cut-off lever on the oxygen distributor, open cylinder valve (with RZ-25 tester set on negative pressure pumping) and start stopwatch. Stopwatch will be stopped when 60 seconds pass. Participant will verbally identify duration of whistle and reading on external gage. Return manual cut-off lever to original position and place the pressure gage back into the protective cover. (No other work can be done during this test.)

12. Failure to conduct a proper high and medium pressure leak test\_\_\_\_\_2

Before turning off the cylinder valve, coat the high and medium pressure lines (connections) with a leak detector solution and observe for leaks (formation of bubbles). This test can be simulated, however, the bench participant shall physically touch each connection with the bottle tip of the leak detector solution (closed). Tests can be conducted anytime while the apparatus is pressurized. Shut off cylinder valve after test.



**STATEMENTS OF FACT  
BENCH BG-174A CONTEST**

1. The positive pressure leak test is to insure that no oxygen escapes to the outside atmosphere during operation of apparatus.
2. A leaking diaphragm will create a low opening pressure.
3. An old diaphragm which has lost its flexibility due to age will create a high opening pressure.
4. The pressure relief valve is designed to open when the pressure within the breathing circuit is between +10 and +40 millimeters (+1 mbar and +4 mbar) of pressure measured on the water gage.
5. Once zero adjustment has been made on RZ-25 tester, do not readjust setting for balance of tests.
6. All connections must be tightened on apparatus and zero adjustment made on RZ-25 tester prior to connecting breathing hoses to apparatus.
7. The exhalation valve should allow the breathing air to pass in only one direction toward the regenerative canister.
8. During the exhalation valve test, if valve is operating properly, breathing bag should not deflate.
9. The inhalation valve should only allow the breathing air to pass in one direction toward the face mask.
10. During testing of the inhalation valve, if valve is operating properly, the breathing bag should not inflate.
11. During the positive pressure leak test, the needle on the RZ-25 tester should not drop more than 10 mm H<sub>2</sub>O or 1 mbar in 60 seconds.
12. The screw ring cover on the lung demand valve assembly and connections on the breathing bag are hand tight connections.

13. The negative pressure leak test is to insure that no toxic gases enter the breathing circuit during operation of the apparatus.
14. During the negative pressure leak test, the needle of the RZ-25 tester should not rise more than 10 mm H<sub>2</sub>O or 1 mbar in 60 seconds.
15. The BG-174A is equipped with a pre-flushing device which automatically purges the nitrogen rich ambient air, initially found in the breathing circuit, with pure oxygen.
16. Once the oxygen cylinder valve is opened and the unit is charged with oxygen, the pressure gage on the oxygen cylinder and the chest gage on the flexible line must equalize to within 10 percent of one another.
17. All BG-174A oxygen cylinders that show zero pressure on the gage must be purged and vacuumed to remove any contaminant or moisture that may have entered due to lack of pressure in the cylinder.
18. The lung demand valve automatically goes into action if more than the allotted dosage of 1.4 - 1.7 LPM of oxygen is consumed by the wearer.
19. During the lung demand valve test, the valve should open between -10 mm H<sub>2</sub>O (-1 mbar) and -40 mm H<sub>2</sub>O (-4 mbar).
20. The breathing bag volume test is done to insure that the breathing bag has correct volume, which should be at least five liters.
21. Each complete stroke of bellows on the RZ-25 tester is equal to 0.5 liter.
22. During the bypass test, a failure of the bypass valve to instantly provide oxygen into and fill the breathing bag at a rate of approximately 50 LPM in less than 10 seconds is an indication of an internal failure in the oxygen distributor.
23. Constant dosage in the BG-174A is preset at approximately 1.5 liters/minute.
24. Three factors affecting constant dosage are: diameter of dosage orifice, constant pressure, and elevation and atmospheric pressure.
25. The dosage orifice within the oxygen distributor has an opening of approximately 0.17 mm.

26. Oxygen under a constant pressure of 57 PSI is forced through the orifice at an approximate rate of 1.5 liters/minute.
27. The constant pressure of 57 PSI is maintained by the reciprocating action in the oxygen distributor.
28. During the constant dosage test, the breathing bag is deflated, the RZ-25 tester is set to red dosage, and the pressure relief valve cover is plugged.
29. During the constant dosage test, the needle of the RZ-25 tester should automatically settle between 1.4 and 1.7 LPM.
30. Although the RZ-25 tester measures dosage, it is not a flowmeter.
31. The RZ-25 tester is operated by over pressurizing the breathing circuit.
32. The pre-flush/dosage line connection is tightened by hand.
33. The plug on the training canister is tightened by wrench.
34. When it is assured that all hand tight and wrench tight connections are securely fastened, low dosage can usually be attributed to a damaged o-ring or washer.
35. Any leak in the breathing circuit will prevent the apparatus from over pressurizing, thus indicating a low dosage.
36. The oxygen cylinder connection is tightened by hand.
37. The locking screw on the saliva trap is tightened by wrench.
38. The hose adapter on the RZ-25 tester is tightened by hand.
39. The breathing hoses are tightened by hand.
40. During the constant dosage test, a reading of less than 1.4 LPM is low dosage.
41. A high dosage indication can almost always be attributed to a leak at the valve head inside the lung demand valve.
42. An internal leak at the valve head inside the lung demand valve may not be detectable with the positive and negative pressure leak tests.

43. The warning whistle is designed to activate when the pressure in the oxygen cylinder has dropped to approximately 20 percent of the original cylinder pressure.
44. During the whistle activation test, the warning whistle should activate at approximately 700 PSI for a four hour apparatus.
45. If during testing the warning whistle fails to activate at the prescribed setting, the warning whistle should be removed from the apparatus and returned to the manufacturer or their agent for adjustment.
46. If while wearing the apparatus the warning whistle should sound with each inhalation or with each activation of manual bypass valve, this is another indication of clogged sieves in the oxygen distributor rather than a defective whistle.
47. During the whistle duration/manual cut-off test, the warning whistle should sound for 20 to 60 seconds before automatically sealing itself.
48. If during the whistle duration/manual cut-off test, the warning whistle sounds less than 20 seconds, it may not be giving the user an adequate warning.
49. If during the whistle duration/manual cut-off test, the warning whistle sounds longer than 60 seconds, it is wasting valuable oxygen.
50. The manual cut-off lever is located on the oxygen distributor.
51. The manual cut-off lever is designed to isolate the chest gage in the event the gage or the flexible line develops a leak during operation.
52. The valve screw should be positioned so that the chest gage and flexible line are isolated when the manual cut-off lever arm is lifted to a 30 to 45 degree angle from the horizontal.
53. Prior to testing whistle duration and the manual cut-off valve, turn oxygen cylinder valve off, lift the manual cut-off lever, open oxygen cylinder valve (with the RZ-25 tester set on negative pressure pumping), and start the stopwatch.

54. When the system is pressurized, the high pressure and medium pressure lines can be tested for leaks by coating the connections with a soap lather or leak detection solution.
55. The BG-174A should be stored to protect against: dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.
56. All parts exposed to the circulatory system of the BG-174A must be thoroughly washed in a good detergent/disinfectant, thoroughly rinsed, and dried after each wearing.
57. The face mask, breathing hose assembly, breathing bag, and lung demand valve assembly are parts exposed to the circulatory system that must be thoroughly washed after each wearing.
58. Before washing the lung demand valve assembly, it is absolutely necessary to isolate the lung demand valve.
59. An improper disinfectant or one that is not diluted properly could cause the rubber or neoprene parts to deteriorate prematurely.
60. Alcohol is not to be used to clean or disinfect any parts of the BG-174A.
61. If alcohol is used to disinfect or clean, it will break down the rubber in the face mask, hoses, and breathing bag.
62. The temperature of the air used to dry parts should not go above 140 degrees F (60 degrees C).
63. Storing the rubber or neoprene parts in areas with fluorescent lighting will have the same effect as direct sunlight.
64. Replace the o-ring at the oxygen cylinder connection at least once every six months.
65. All rubber or neoprene sealing rings should be replaced at least once every two years.
66. A new inhalation valve should be inserted into the lung demand valve assembly at least once every two years.

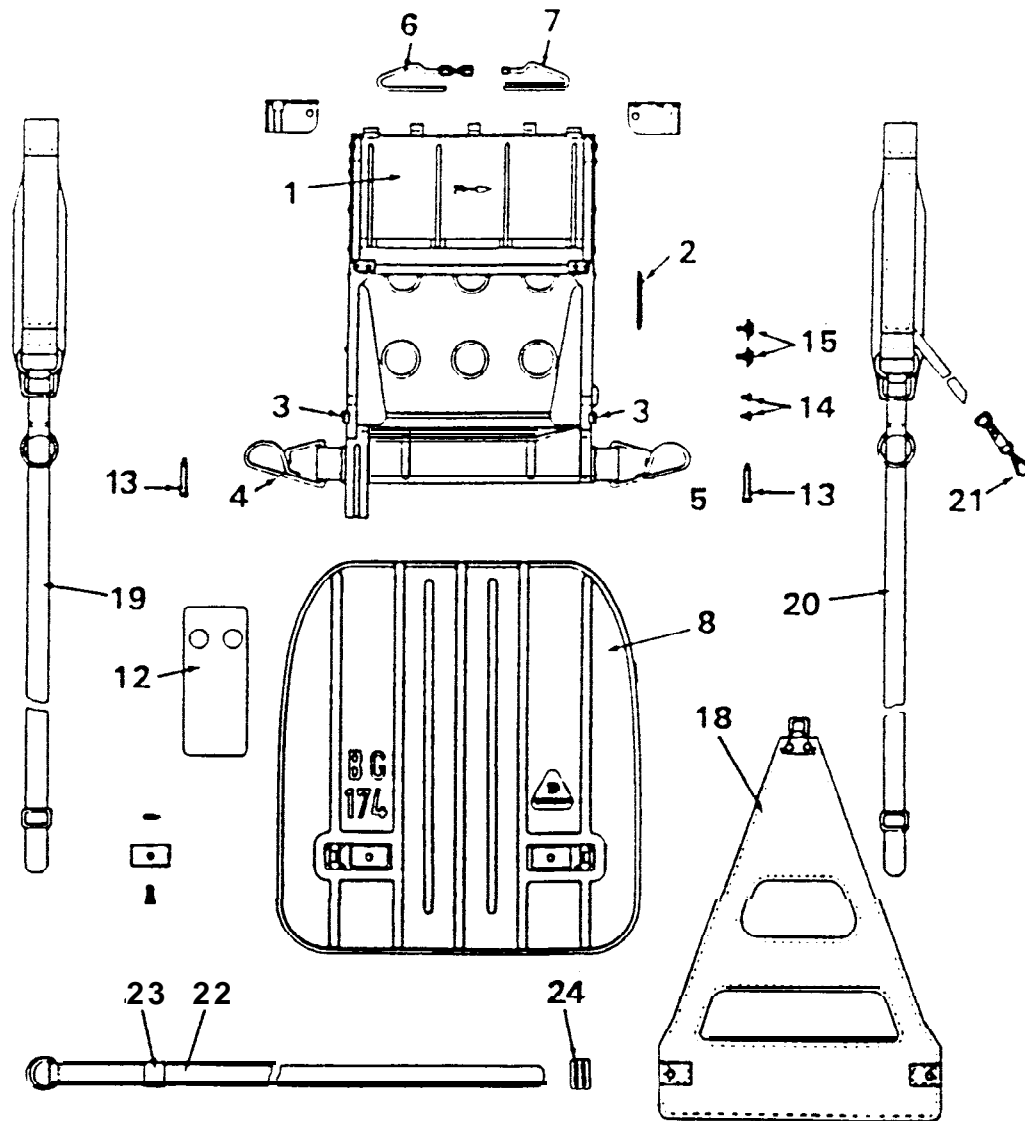
67. The lung demand diaphragm should be replaced after at least three years usage.
68. The o-ring under the speaking diaphragm should be replaced at least once every three years.
69. The oxygen distributor should be returned to the manufacturer or their agent for complete overhaul after at least five years usage.
70. The oxygen cylinder must be retested by a certified testing facility every five years.
71. The test date in month and year is stamped on top of all oxygen cylinders.
72. The lung demand valve assembly should be replaced at least every six years.
73. The warning whistle should be returned to the manufacturer or their agent for overhaul after at least six years usage.
74. When copper gaskets are removed from the BG-174A for any reason, they should not be reused.
75. Only USP medical oxygen is to be used to fill the BG-174A oxygen cylinders.
76. Before filling any oxygen cylinder, check the service rating and hydrostatic test date stamped on the cylinder.
77. If the oxygen cylinder is rated at 2600 PSI or 2850 PSI, it can be filled up to these pressures only.
78. Only oxygen cylinders rated at 2850+ can be filled to 3135 PSI.
79. The temperature in the areas for filling and storage of oxygen cylinders should be maintained at approximately 70 degrees F.
80. During the filling cycle, the temperature in the oxygen cylinder will rise in proportion to how fast the cylinder is filled.
81. A prerequisite for the safe use of an oxygen breathing apparatus is a proper maintenance program.

82. It is very important that an accurate record be kept of each test performed on the BG-174A with the RZ-25 tester.
83. When using a factory packed regenerative canister, insure that the seal is in place and the expiration date has not been reached prior to removing the end caps and inserting the canister into the apparatus.
84. The expiration date is stamped on the white label attached to each factory packed regenerative canister.
85. The expiration date on each factory packed regenerative canister appears as a month and year.
86. The BG-174A apparatus will not offer protection against poisonous gases absorbed through your skin.
87. The wearing harness consists of two adjustable shoulder straps with double slide buckles and a waist belt.
88. On the top of the oxygen cylinder is a safety device known as the pressure burst cap.
89. The pressure gages are marked in increments of 200 PSI and are luminous, so you can see them in the dark or in other conditions that limit visibility.
90. The special chemicals inside the regenerative canister absorb the carbon dioxide from the air that is exhaled by the wearer.
91. There are two types of canisters you can use with the Draeger BG-174A apparatus, refillable training canister and factory packed disposable canister.
92. The refillable training canister is made of stainless steel and can be used over and over again as long as the absorbent chemicals are freshly packed for each use.
93. Inside the refillable training canister is a set of baffles designed to expose more surface area of the chemicals to the exhaled air.
94. If the factory packed disposable rescue canister has expired, yet is still factory sealed, it can be used for training provided that the chemicals can be heard rattling around when the canister is shaken and the canister has not gained 10 or more grams in weight.

95. The lung demand valve assembly contains the diaphragm, pressure relief valve, lung demand valve, and inhalation and exhalation valves.
96. The pressure relief valve is the part of the lung demand valve assembly that keeps oxygen from building up in the breathing bag if you use less than the unit provides.
97. The saliva trap is on the inhalation hose because it must be located on the lowest part of the apparatus when it is worn so that the moisture will settle there.
98. Heat buildup within the unit's system is produced when your exhaled air flows through the regenerative canister.
99. The area where oxygen cylinders are filled and stored must have adequate ventilation to prevent a buildup of oxygen and reduce the potential for fire.
100. If you're using a high pressure oxygen pump to fill an oxygen cylinder, the pump itself should have a filter dryer installed on the gas inlet side of the pump to prevent moisture and dust from getting into the oxygen.

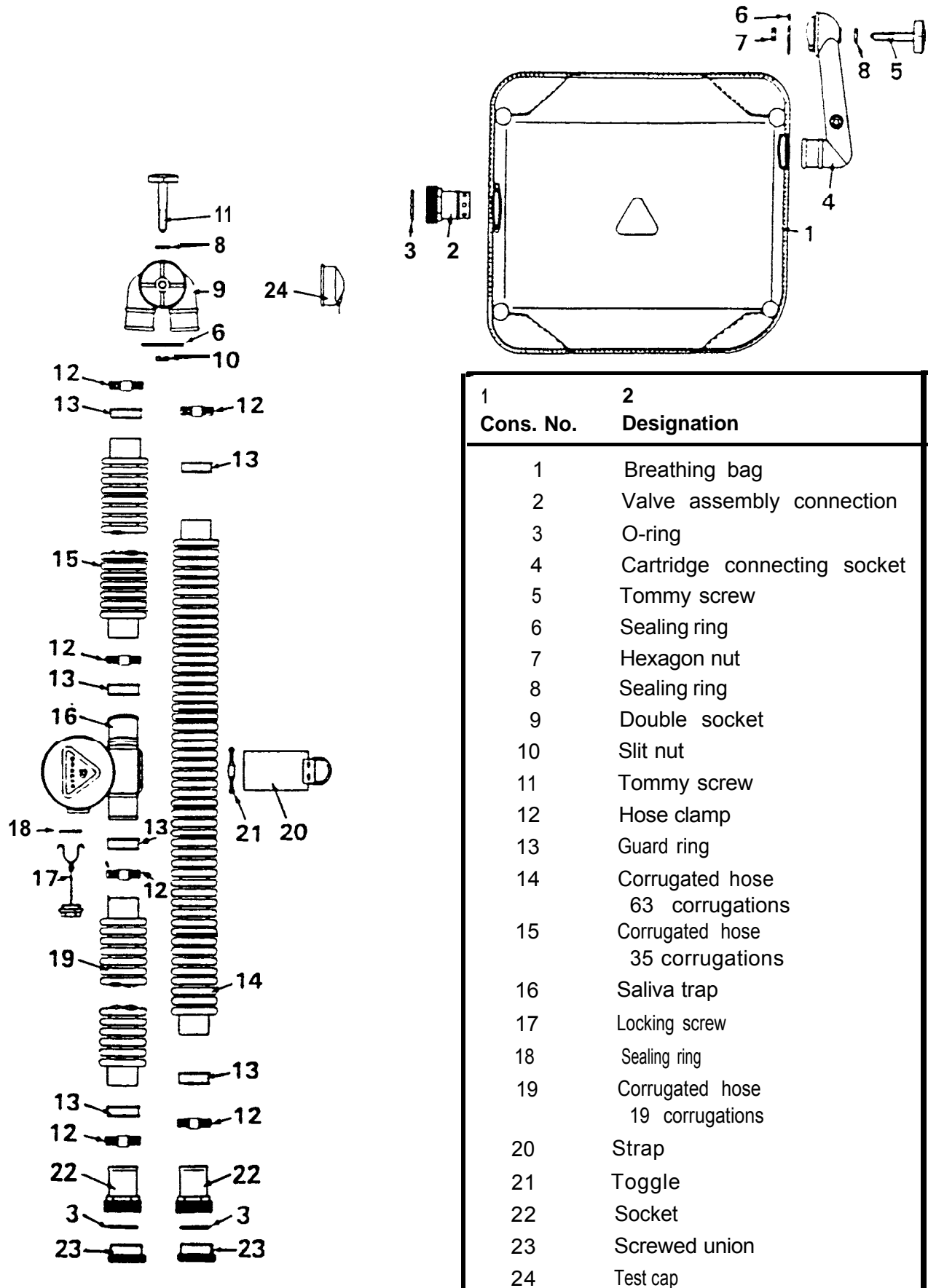


# Carrying Frame Assembly with Protective Shell

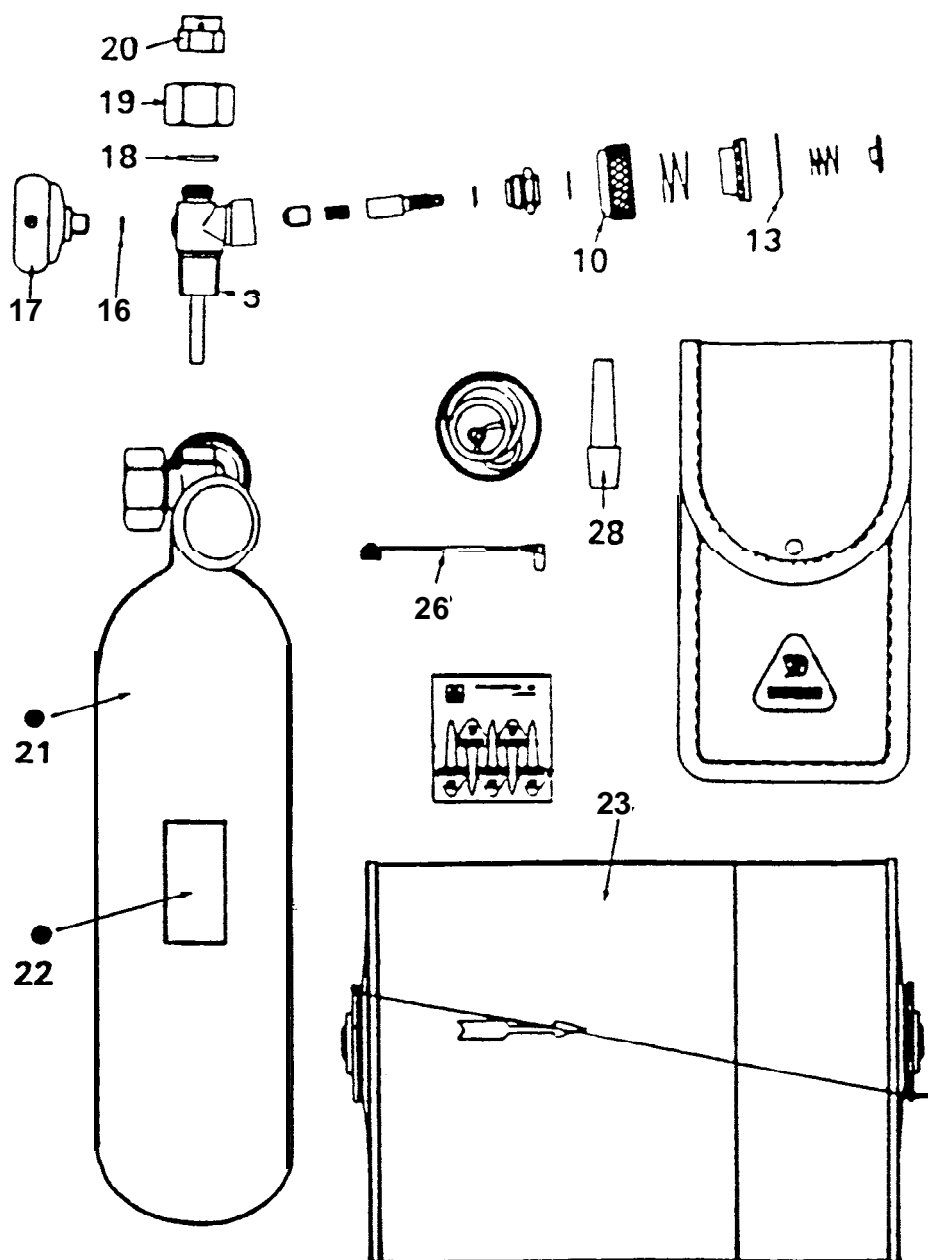


1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Carrying support	13	Screw
2	Protection ring	14	Screw
3	Snap	15	Screw
4	Belt bearing block, left	18	Back spanning
5	Belt bearing block, right	19	Carrying strap, left
6	Carrying loop, left	20	Carrying strap, right
7	Carrying loop, right	21	Buckle
8	Protective casing	22	Waist-belt
12	Approval label BG 174 A(4 h)	23	Slide
		24	Slide

# Breathing Bag and Hoses Assemblies

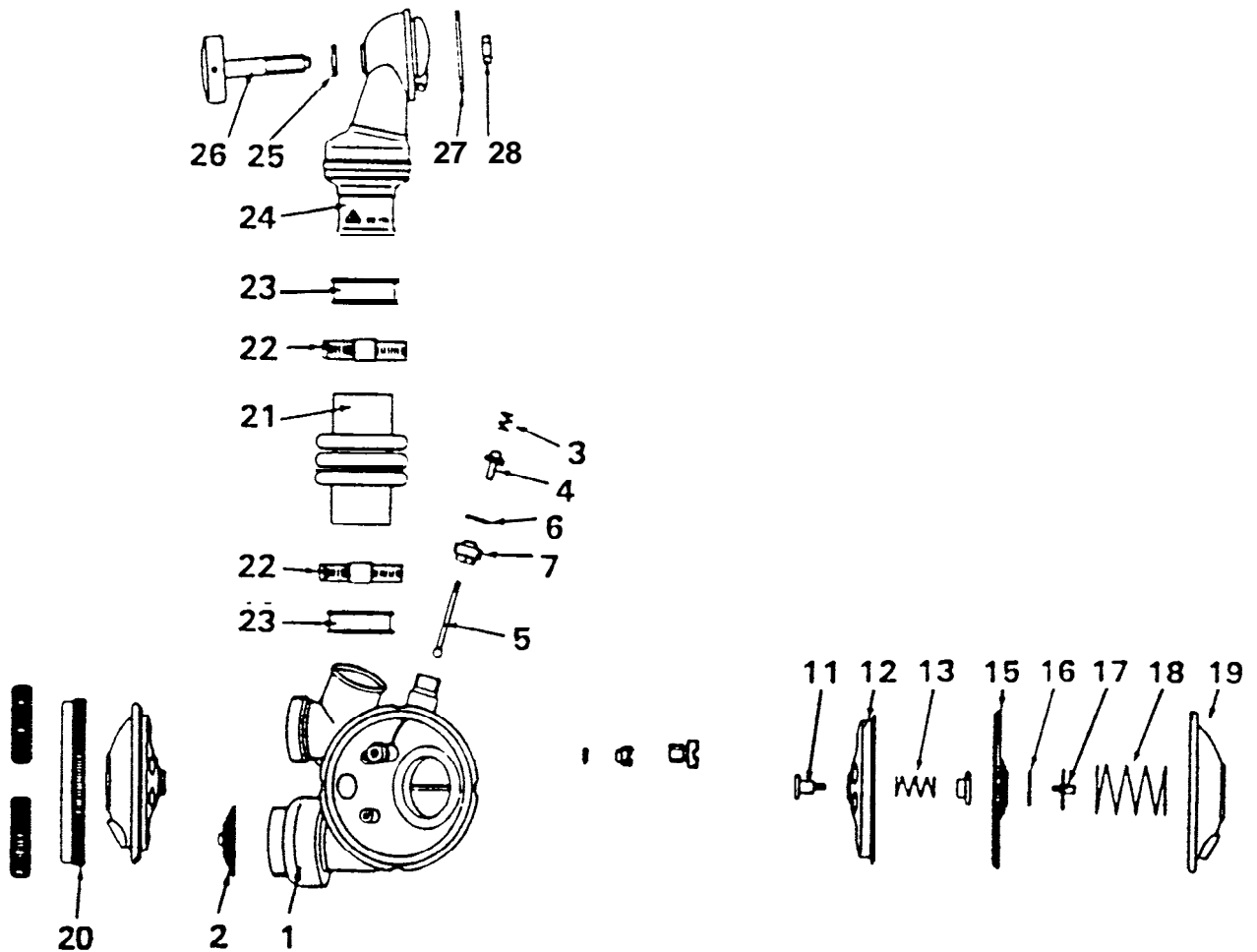


## O<sub>2</sub> Cylinder, Cylinder Valve, Alkali Cartridge, Tool Kit



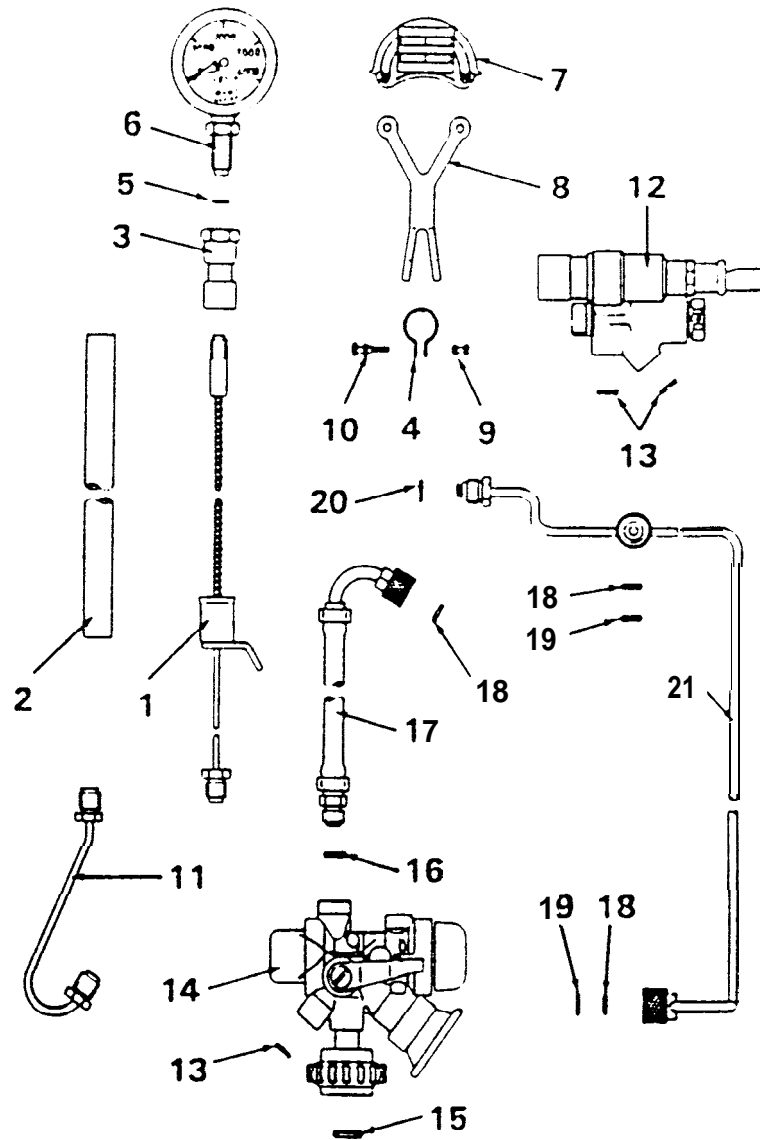
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
3	Valve housing	20	Bursting disc
10	Hand-wheel	21	Oxygen cylinder (4h)
13	Safety ring	22	Label (4h)
16	Sealing ring	23	Alkali cartridge
17	Manometer	26	Double washer
18	Lock washer	28	Test plug
19	Lock nut		

# Lung Demand Valve Assembly



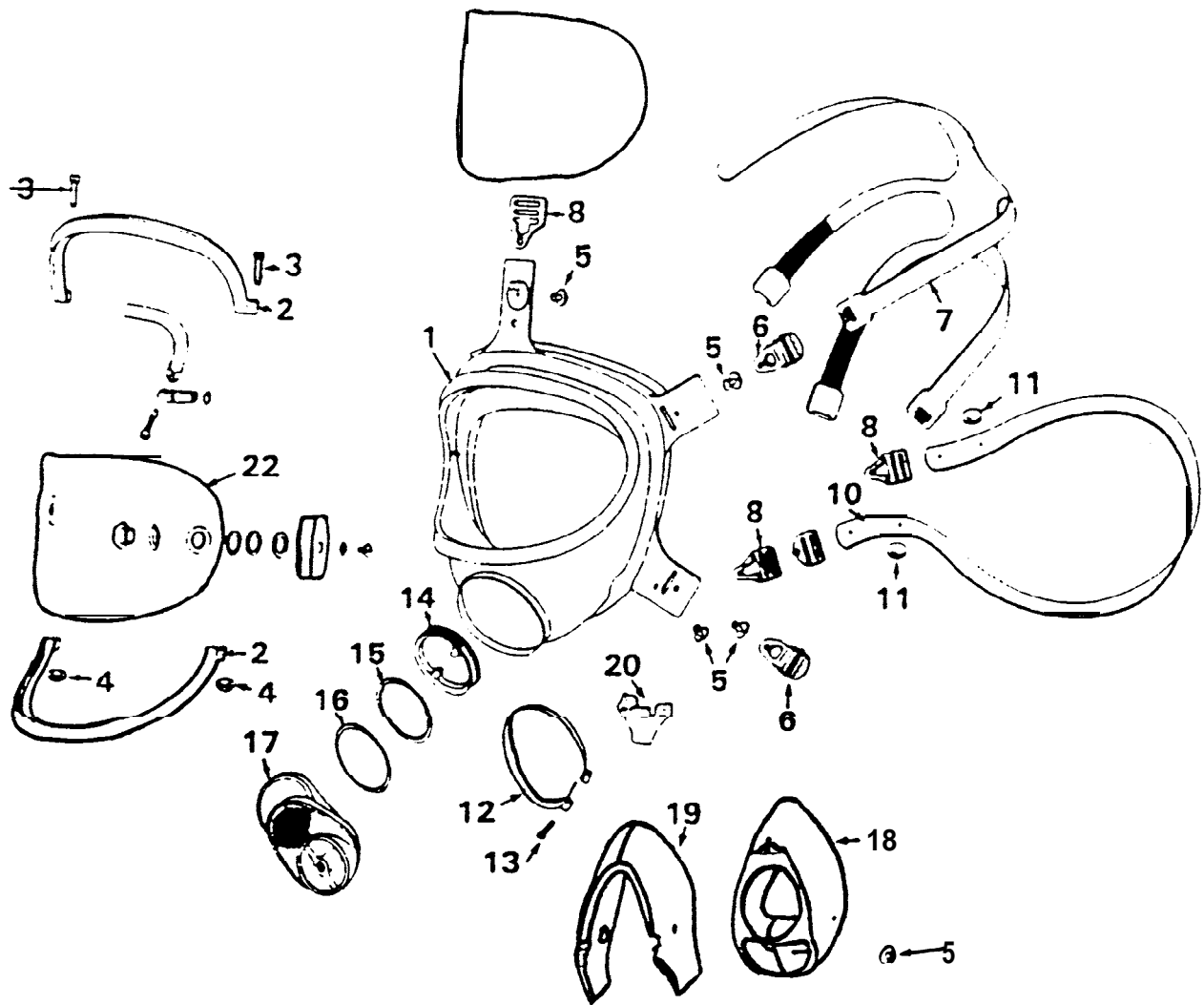
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Valve box frame	17	Valve disc
2	Valve disc	18	Spring
3	Spring	19	Housing cover
4	Valve disc	20	Screw ring
5	Lever	21	Corrugated hose
6	Sealing ring	22	Hose clamp
7	Valve seat	23	Guard ring
11	Thrust bolt	24	Valve socket
12	Protective cage	25	Sealing ring
13	Spring	26	Tommy screw
15	Diaphragm	27	Sealing ring
16	Lock washer	28	Hexagonal nut

## O<sub>2</sub> Regulator, Warning Whistle, Oxygen Lines



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	High pressure line	12	Rest pressure warning
2	Protective hose	13	Sealing ring
3	Threaded sleeve	14	Oxygen distributor
4	Clamp	15	O-ring
5	Sealing ring	16	Sieve insert
6	Pressure gauge	17	Pre-flushing line
7	Protective cap	18	O-ring
8	Tightening strap	19	O-ring
9	Bushing	20	Sealing ring
10	Screw	21	O <sub>2</sub> -line
11	High pressure line		

## Panorama Z/ZS Mask



1	2	1	2
Cons. No.	Designation	Cons. No.	Designation
1	Mask body	12	Tightening strap
2	Frame	13	Screw
3	Screw	14	Screw ring
4	Nut	15	Speech diaphragm
5	Stud	16	O ring
6	Roller buckle	17	Connecting piece
7	Headstrap	18	Inner mask
8	Slide with eye	19	Filling piece
10	Strap	20	Support plate
11	Stud	22	Face plate

***SECTION IV***

***BENCH***

***BG-4***

2005 BENCH BG-4 CONTEST RULES

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Section IV

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## **RULES GOVERNING 2005 BENCH BG-4 CONTEST AND INTERPRETATIONS OF DISCOUNT CARDS**

1. Each participant must be under guard before the start of the Contest in a location assigned by the Chief Judge and must remain continuously under guard until time to work the problem. Participants under guard must be in a location where they will be unable to obtain any information concerning the problem to be worked. Any participant receiving information concerning a Contest problem prior to starting to work the problem will be disqualified by the Chief Judge and the Assistant Chief Judge. No person, except guards and Contest officials assigned to give the written examination, will be allowed to communicate with any participant under guard. Those who have performed will not be permitted to communicate with any participant awaiting their turn to perform.
2. Any indication of receiving unauthorized information during the working of the problem may result in disqualification as determined by the Chief Judge and the Assistant Chief Judge. No one except judges, Contest officials, and working participants will be permitted in the work area, unless special approval is given by the Chief Judge. Communication with bench participants, except for the judges, is prohibited. News media and photographers who wish to be in the working area must receive permission from the Director and be accompanied by a Contest official.
3. Any bench participant not in place and ready at the time specified will be disqualified from the Contest.
4. The bench participant will be provided with two BG-4 apparatuses (one disassembled, one assembled), an RZ-25 tester, a stopwatch, defogging solution, leak detector fluid, test kit and a tool kit. Only the tools and fluid provided will be used for testing and assembly of the apparatus. The work at the bench will consist of (1) a visual examination of a disassembled BG-4 and the proper assembly and preparation for use in rescue work. This will include correcting any predetermined problem(s) so that the apparatus is in proper working order. Simulating defogging of the facepiece lens will be done as part of the visual examination. This visual examination, correcting predetermined problem(s), and proper assembly can be done at any time allowed for working of the problem. (2) Test the assembled BG-4 apparatus with a RZ-25 tester, and correct the predetermined problem(s) so that the apparatus is in proper working condition. Except for removing the plug-in coupling from the breathing hoses at the connection, the assembled BG-4 apparatus cannot be disassembled to look for problems, until the hoses are attached to the RZ-25 tester. When testing is completed on the assembled BG-

- 4 apparatus, the hoses shall be removed from the tester, connected to the facepiece, and the back cover installed. This shall be done before the clock is stopped.
5. Spare parts to correct the predetermined problem(s) will be provided once the bench participant has specifically identified the problem. This will require the participant to point out the exact location of the deficiency. (Example: Positive pressure leak in the breathing bag. Participant will identify the location of the hole.)
  6. When an unplanned deficiency is encountered with the apparatus, the participant will be notified by the judges that the deficiency is not part of the problem. The judge will stop the clock, and any time used to correct the deficiency will not be charged to the working time. However, the process of verbal elimination shall not be used by the bench participant to find the predetermined problem(s). If it becomes obvious to the judges that this is occurring, the first offense will result in a warning, the second offense a discount, and the third offense could result in disqualification as determined by the Chief Judge. (Example: Participant verbally identifies a deficiency with every part of the facepiece when only one predetermined problem exists.)
  7. The bench participant will not be allowed to bring any materials, written information, or records to the work site. The participant will not have to create a test record; however, he or she may write the test from memory on paper that will be provided for that purpose after the official working time has started.
  8. Tests will be performed in sequence on the assembled BG-4 apparatus using the standard test procedures with the RZ-25 tester as outlined in the Draeger BG-4 Service Manual (P/N 4056575 - Rev. 0, April 2002).
  9. A maximum of 30 minutes will be allowed to complete the problem. The bench judge will inform the participant when he has one minute remaining to work the problem. At the completion of the problem, the judge(s) and the participant will note the working time of the problem with the official timekeeper. Work done after the clock is stopped will not be recognized.
  10. Manually abusing or intentionally over or under pressurizing the RZ-25 tester substantially will be considered abusing the equipment. If the participant is observed abusing the RZ-25 tester, the first offense will result in a warning, the second offense will result in a discount, and the third offense could result in disqualification as determined by the Chief Judge.

A. Written Examination of Bench Participant

1. The written examination shall consist of 30 questions. Twenty questions for the written examination will be taken verbatim from the Statements of Fact which will be fill in the blank and each blank shall represent a key word with no more than three blanks per statement. Ten questions will be taken verbatim from identification of parts. Thirty minutes will be allowed for the written examination.
2. In special circumstances, individual bench participants may be given oral instead of written examinations by at least two judges. Requests for consideration shall be presented to the Director of the Contest at the time of registration.
3. Bench participants will be separated to the extent possible, and every effort will be made to prohibit discussion of questions and answers among the bench participants.

B. Miscellaneous

1. In the event of ties in the Bench Contest, the number of discounts at bench will be the first tie breaker; the number of discounts on written examination will be the second tie breaker; and the official working time at bench in minutes and seconds will be the third tie breaker.
2. The bench participant and trainer will report to a designated location to review and prepare protests within one hour of notification. Twenty minutes will be given to review and prepare written protests. All protests will be considered by the Chief Judge and his/her Assistant and their decision will be binding.
3. Bench participants must be bonafide employees of the mining industry or members of mine rescue teams designated to fulfill the requirements of 30 CFR Part 49. This does not exclude bench participants whose team is not participating at the National Contest.
4. Disputes with regard to the Bench Contest (except discounts), shall be immediately filed with the Director. Disputes filed shall be in writing and set forth incidents, times, names, source of information and act complained against. Complainant shall remain accessible to the Director until the complaint is resolved. A decision by the Director shall be final.

## Interpretations of Discount Sheet

### A. Written Examination

1. For each incorrect answer\_\_\_\_\_1

### B. Time

The time will be recorded in minutes and seconds.

### C. Competition at Bench

1. Failure to verbally identify each test being conducted\_\_\_\_\_2

Verbally identify each test being performed.

2. Failure to verbally identify each problem\_\_\_\_\_5

Failure to verbally identify is also interpreted as failure to find the problem.

3. Failure to correct each problem\_\_\_\_\_5

The bench participant shall properly correct the problem and continue with the proper tests. Once a bench participant finds a predetermined problem and does not correct it before continuing with the remaining tests, he/she shall receive a five point discount for continuing without correcting the problem and a pending five point discount for failing to correct the problem. If all of the remaining tests are properly conducted and passed and the participant returns to the uncorrected problem and corrects it, the pending five point discount will not be assessed. Should the participant continue on from this point and properly conduct all of the remaining tests again, he/she would also have the original five point discount for continuing tests removed.

4. Failure to conduct any visual examination or test on the BG-4, each test\_\_\_\_\_5

5. Failure to tighten connections properly during assembly or testing, each connection\_\_\_\_\_1

All connections must be tightened on the apparatus and verbally identified as hand tight at the time the connection is made. Failure to verbally identify at the time the connection is being made will result in

a one point discount for each. Zero adjustments shall be made on RZ tester prior to connecting the breathing hoses to the RZ-25 tester.

This includes:

- .Cap on drain valve - hand tight
- .Drain valve to breathing bag - hand tight
- .Minimum valve to breathing bag - hand tight
- .Minimum valve to O2 supply line - hand tight
- .Cylinder connection - hand tight
- .Regenerative canister connections - hand tight
- .Relief valve connection - hand tight
- .Cooler to bag connection - hand tight
- .Distribution hose connection - hand tight
- .Breathing hoses (once testing has begun or during the visual examination on the disassembled apparatus) - hand tight
- .Hose adapter on the RZ-25 - hand tight

Once the zero adjustment on the tester has been made, do not readjust setting for balance of tests.

6. Failure to comply with rules not covered in discount sheet, each infraction\_\_\_\_\_2

If the discount is not listed on the discount sheet, and if it is not covered under one of the approved rules of the Contest, do not improvise a discount to cover the suspected violation.

D. Visuals

1. Failure to conduct a proper visual examination of the frame/harness\_\_\_\_\_1

The visual examination will include an examination of the harness assembly, frame, back cover, visible sealing rings, display, O<sub>2</sub> regulator, and Monitron basic unit. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

2. Failure to conduct a proper visual examination of the breathing bag\_\_\_\_\_1

The participant will verbally identify that the breathing bag is being examined for pliability and signs of deterioration. Stretching or

manipulating the breathing bag with a massaging action will be part of this examination. The participant will verbally identify that the sealing surfaces are being examined for signs of deterioration or damage. Also, the minimum valve, drain valve, lever, and springs will be examined for damage. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

3. Failure to conduct a proper visual examination of the O<sub>2</sub> cylinder\_\_\_\_\_1

A proper cylinder examination includes a visual inspection of the cylinder. The participant will verbally identify the cylinder pressure on the gage, the pressure rating on cylinder, the hydrostatic test date, and identify if the cylinder is plus rated. Participant will inform the judge if the cylinder pressure is less than 2,680 PSI. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

4. Failure to conduct a proper visual examination of the regenerative canister\_\_\_\_\_1

A proper examination includes a visual inspection for defects. If a factory packed canister is used, verbally identify that the sealing surfaces are not damaged, and identify the expiration date with month and year. If a reusable cartridge is used, a visual inspection for defects, seal strap with tension spring hook, seal, scrubber screens and filler mats are required. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 3 points)

5. Failure to conduct a proper visual examination of the relief valve\_\_\_\_1

A proper examination includes a visual inspection for defects. Verbally identify that the valve and o-ring are not damaged.

6. Failure to conduct a proper visual examination of the cooler\_\_\_\_\_1

A proper examination includes a visual inspection for defects. Verbally identify that the sealing surfaces are not damaged.

7. Failure to conduct a proper visual examination of the hoses\_\_\_\_\_1

The participant will verbally identify that the hoses are being inspected for pliability and signs of deterioration. Stretching or manipulating the

hoses with a massaging action will be part of this examination. The participant will verbally identify that the sealing edges, including bayonet rings are being examined for signs of deterioration. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 2 points)

8. Failure to conduct a proper visual examination of the coupling, inhalation and exhalation valves\_\_\_\_\_1

A proper examination includes a visual inspection for defects, sealing surfaces and valve discs.

9. Failure to conduct a proper visual examination of the facepiece\_\_\_\_\_1

The visual examination will include an examination of the head strap assembly, mask body (including sealing edges), the lens, speaking diaphragm, and wiper. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

E. RZ-25 Tester

1. Failure to conduct a proper low pressure warning test\_\_\_\_\_2

Connect breathing hoses to test unit. Set RZ-25 tester on positive pressure pumping, gently activate bellows, and watch the pressure gauge. If the low pressure warning is operating properly, warning should be activated when the pressure is less than 1.25 mbar.

2. Failure to conduct a proper inhalation valve test\_\_\_\_\_2

The RZ-25 tester is set on positive pressure pumping. Tightly pinch the exhalation hose with your hand. Gently activate bellows until 10 mbar is indicated on the pressure gauge.

3. Failure to conduct a proper exhalation valve test\_\_\_\_\_2

Set the RZ-25 tester on negative pressure pumping. Tightly pinch the inhalation hose with your hand. Gently activate bellows until -10 mbar is indicated on the pressure gauge.

4. Failure to conduct a proper drain valve test\_\_\_\_\_2

Set RZ-25 tester on positive pressure pumping. Pump bellows until 10 mbar is indicated on the pressure gauge. While pumping, fit the open side of the sealing cap over the tappet of the relief valve and hold it tightly until it is pressed into place by the inflated breathing bag. The drain valve must not open at 10 mbar.

5. Failure to conduct a proper leak test with positive pressure\_\_\_\_\_2

Set RZ-tester on leak test. Bleed needle to 7 mbar and start stopwatch. Needle should not change more than 10 mm H<sub>2</sub>O or 1 mbar in 60 seconds. Set RZ-tester on negative pressure pumping, the breathing bag is vented. Remove the sealing cap.

6. Failure to conduct a proper relief valve test\_\_\_\_\_2

Set RZ-tester on positive pressure pumping. Pump the bellows until the relief valve opens, it should open between 2 and 5 mbar. Participant will verbally state reading of valve opening.

NOTE: An alternate relief valve test may be conducted by observing the reading on the RZ tester (with the tester set on leak test). Flow of oxygen from the constant dosage will cause relief valve to open between 2 and 5 mbar. If this alternate test is used, it must be conducted after the completion of the bypass valve test.

7. Failure to conduct a proper high pressure leak test\_\_\_\_\_2

Set RZ-25 tester on leak test. Open cylinder valve. Watch the display unit, the cylinder pressure is indicated here. If it is lower than 2680 psi. change the oxygen cylinder. If it is greater than 2680 psi., alarm sounds once. Display reads CCr, as soon as the pressure display appears, close cylinder valve.

The test result is available after approx. 25 seconds:

Alarm sounds once.

Green indicator flashes.

Display reads OCr, as soon as the pressure display appears, open cylinder valve.



8. Failure to conduct a proper constant metering valve test\_\_\_\_\_2

Set RZ-25 tester on positive pressure pumping. Pump bellows until the breathing bag is inflated. While pumping, fit the open side of the sealing cap over the tappet of the relief valve and hold it tightly until it is pressed into position by the inflated bag. Set the RZ-tester on Red Dosage 0.5 - 2 L/min. The constant metering quantity should lie between 1.5 and 1.9 L/min. Participant will verbally state dosage value on the red scale, as soon as the pointer has stopped moving.

9. Failure to conduct a proper minimum valve test\_\_\_\_\_2

Set RZ-25 tester on negative pressure pumping. The breathing bag is vented automatically, remove sealing cap, pump bellows until minimum valve is heard to open in breathing bag and there is a hissing sound. Watch the pressure gauge, the minimum valve should open at a value between 0.1 and 2.5 mbar. Participant will verbally identify reading of opening of valve.

10. Failure to conduct a proper bypass valve test\_\_\_\_\_2

Set RZ-tester on leak test. Press red button for bypass valve. Oxygen must be heard to flow into the circuit, the breathing bag inflates.

11. Failure to conduct a proper low pressure warning test\_\_\_\_\_2

Close cylinder valve. Watch the display unit. The warning should be generated at approx. 700 psi. Alarm sounds intermittently, red indicator flashes. Unplug coupling from RZ-tester. Participant will verbally state reading.

12. Failure to conduct a proper battery test\_\_\_\_\_2

The Monitron system automatically checks the battery at pressures below 70 psi. If the battery capacity is sufficient, the Monitron system will switch off immediately after the test completes.

## STATEMENTS OF FACT BENCH BG-4 CONTEST

1. A positive pressure leak could be caused by a leakage in or at device components.
2. The battery in the Monitron basic unit should be replaced every 6 months.
3. Dow Corning 111 is to be used to lubricate o-rings.
4. The pressure relief valve is designed to open when the pressure within the breathing circuit is between +20 and +50 millimeters (+2 mbar and +5 mbar) of pressure measured on the water gage.
5. To prepare for testing adjust zero point of the RZ-25 tester.
6. Test adapter is used to connect the BG-4 apparatus to the RZ-25 tester.
7. A leaky exhalation or inhalation valve could be caused by a defective valve seat of valve disc.
8. During the exhalation valve test, if valve is operating properly, -10 mbar is indicated on the pressure gauge.
9. The EPDM breathing hoses use quarter turn connectors.
10. During testing of the inhalation valve, if valve is operating properly, +10 mbar is indicated on the pressure gauge.
11. During the positive pressure leak test, the pressure change within 1 minute must be lower than 1 mbar.
12. Only DRAGERSORB 400 is to be used to fill the reusable cartridge.
13. The factory filled cartridge is good for 4 years from the manufacture date.
14. A positive pressure in the breathing circuit prevents ambient air from entering the system.
15. The BG-4 is approved with one time factory packed or refillable style canisters.

16. The Monitron electronic monitoring system comprises a sensor unit, basic unit, and display unit.
17. A steel cylinder is full at 3135 psi when a + is stamped at hydrotest.
18. The BG-4 constant dosage must be 1.5 to 1.9 L/min.
19. The drainage valve should not open at less than 10 mbar.
20. A fully filled steel oxygen cylinder holds 440 liters of medical oxygen.
21. The accuracy of the Monitron pressure measurement is +or- 2% of the final value.
22. Never replace the battery in potentially explosive areas.
23. First stage reducer dosage output is 1.5 to 1.9 L/min.
24. First stage reducer bypass output is >50 L/min.
25. The weight of a fully charged BG-4 apparatus is 15kg (33 lbs)
26. The first stage reducer relief valve activation is 6 bar (87psi)
27. Check the supply of oxygen gas on the display unit at intervals of approximately 15 minutes.
28. During the constant dosage test, the breathing bag is inflated, the RZ-25 tester is set to red dosage, and the pressure relief tappet is capped.
29. During the constant dosage test, the needle of the RZ-25 tester should automatically settle between 1.5 and 1.9 LPM.
30. The minimum valve provides greater than 80 L/min flow.
31. The breathing bag has a 5.5 liter volume.
32. Insert speech diaphragm, install threaded ring and tighten with spanner wrench.
33. The belt and harness must be dried prior to storage, to prevent growth of mold and fungus.

34. The pressure reducer must be rebuilt/overhauled every 6 years.
35. Only the following batteries are approved for use in the Monitron:  
Duracell  
Eveready  
Panasonic  
Rayovac
36. The monitron converts pressure into digital signal.
37. The cylinder connector and cylinder valve must not be contaminated with oil or grease.
38. Two hexagon socket head screws are used in the battery cover of the monitron basic unit.
39. Rubber parts must be particularly protected from direct exposure to radiation.
40. Do not use any solvents, such as acetone, alcohol, benzene, white spirit, trichlorethylene, etc. for cleaning rubber and silicone parts.
41. The first low-pressure warning occurs when the pressure drops to approximately 700 psi.
42. At the first low-pressure warning approximately 75% of the oxygen has been used up.
43. The last low-pressure warning occurs when pressure has dropped to approximately 145 psi.
44. During the low pressure warning test, the alarm should activate at approximately 700 PSI for a four hour apparatus.
45. At the last low-pressure warning approximately 95% of the oxygen has been used up.
46. The Monitron switches off automatically when the pressure drops below 70 psi and after automatically testing the battery.
47. When the first low pressure warning occurs, the alarm sounds intermittently for approx. 30 seconds and the red indicator flashes constantly.

48. When the last low pressure warning occurs, the alarm sounds intermittently without stopping and the red indicator flashes constantly.
49. Medium pressure in the BG-4 is between 58 psi and 64 psi.
50. Medium pressure is delivered to the minimum valve.
51. The Monitron has a piezoelectric alarm.
52. The drainage valve opens at more than 10 mbar.
53. The BG-4 breathing circuit is designed with an air cooler that can be filled with ice to reduce the temperature of the inhaled breath.
54. The venting hole located in the air cooler lid must point upwards.
55. All parts which come in contact with the exhaled air must be thoroughly cleaned and disinfected after use.
56. Disinfect parts by immersing them in a disinfectant bath using Airkem 33.
57. All parts which come in contact with the exhaled air must be thoroughly cleaned and disinfected after use.
58. Before washing the minimum valve, it is necessary to isolate the minimum valve with plug.
59. Attach minimum valve to breathing bag so that the pin of the minimum valve and the mark on the breathing bag line up.
60. All parts which have been disinfected should be rinsed thoroughly under running water.
61. CO<sub>2</sub> absorber is not approved for use after indicated expiration date.
62. The maximum temperature of the air used to dry parts should not go above 140 degrees F (60 degrees C).
63. Replace the high-pressure O-ring located on the pressure reducer yearly for units which are in constant use.

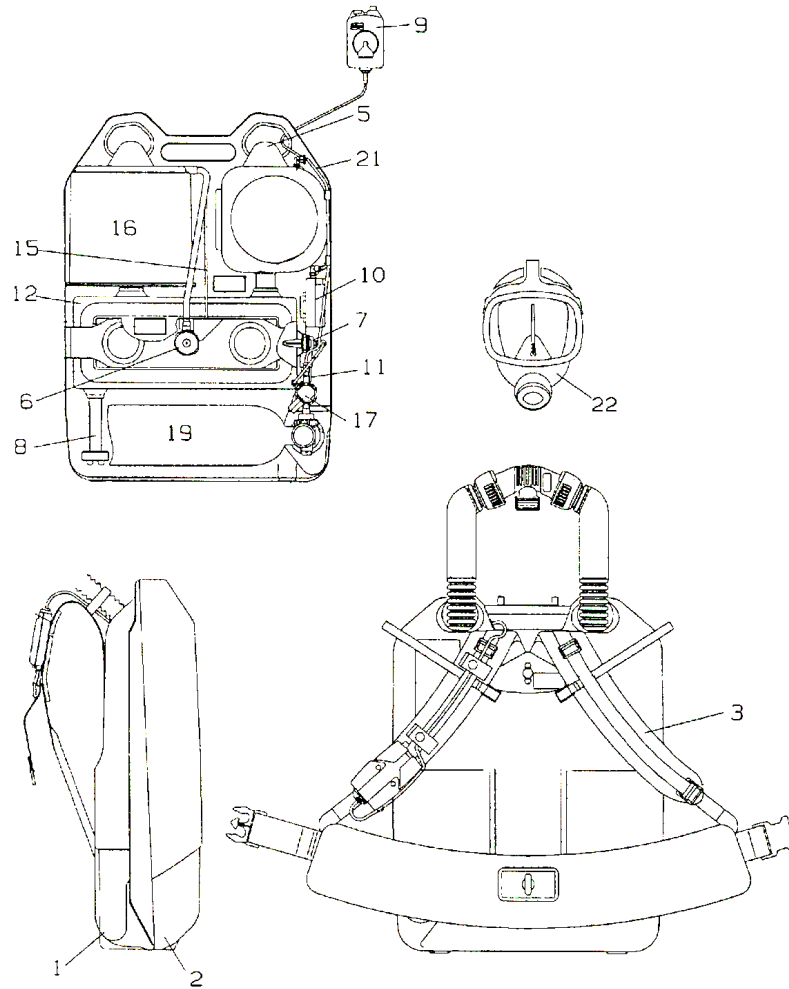
64. U.S. D.O.T. hydrotest composite cylinders every 3 years.
65. Replace the o-ring at the plug-in coupling at least once every year for units which are in constant use.
66. The inhalation valve should be replaced every three years for units which are in constant use.
67. The exhalation valve should be replaced every three years for units which are in constant use.
68. The o-ring under the speech diaphragm should be lubricated with Dow Corning 111.
69. The pressure reducer should be returned to the manufacturer or their agent for complete overhaul after at least six years usage.
70. A steel oxygen cylinder must be retested by a certified testing facility every five years.
71. The BG-4 is approved for use at temperatures above -5 degree C (23 degree F)
72. The breathing bag is made of polyurethane.
73. A defective pressure reducer should be returned to the manufacturer or their agent for service as needed.
74. The breathing bag has a volume of 5.5 liters.
75. Only oxygen (medical grade or better) with > 99.5% purity is to be used to fill the BG-4 oxygen cylinders.
76. The use of ice in the cooling system is only required at ambient temperature above 0 degree C (32 degree F).
77. Pressurized oxygen in contact with oil, grease, or other contamination can result in fire or explosion.
78. Battery test II is performed with each opening of the cylinder valve.

79. Battery test I is performed with each shutting off of the cylinder valve.
80. A defective pressure reducer is the probable cause if the manual by-pass valve does not blow-off.
81. If the pressure indication is out of indication tolerance the monitron display unit should be replaced.
82. If the display does not read properly press a magnet on the rear of the Monitron basic unit and conduct a master reset.
83. Bypass output is > 50 L/min.
84. Relief valve activation is 6 bar or (87 psi).
85. The oxygen cylinder safety burst disc ruptures at 4,000 psi (275 bar).
86. Refillable cartridge concerns are over packing and under packing.
87. The EPDM and silicone masks allow 90% peripheral vision.
88. Polycarbonate or plexiglas lenses can be used in the mask.
89. A minimum of 2680 psi is needed for the BG-4 to perform a proper high pressure leak test.
90. The drainage valve opens at approximately 15 mbar and is therefore out of the RZ reading range.
91. To prepare the ice pack:  
Fill the ice receptacle with water up to 2 inches from rim  
Freeze at least 16 hours @ 5 degrees F (-15 degrees C)  
Fill to rim with water  
Freeze again for another 8 hours
92. Never use a leaking mask.
93. If the speech diaphragm is deformed or shows signs of damage, it must be replaced.
94. The BG-4 display lights up when the button is briefly pressed.

95. The period of use since commencing the mission is indicated on the display in minutes when the button is pressed for approx. 3 seconds.
96. Do not re-use factory packed cartridges.
97. The breathing hoses are equipped with anti-crush rings.
98. The shelf life of the factory packed CO<sub>2</sub> absorber is reduced after installation in the BG4, provided that the breathing bag, breathing hose and relief valve are connected and the breathing circuit is sealed by means of cap R33588.
99. After a factory packed CO<sub>2</sub> absorber has been installed in an apparatus, the installation date must be marked on the housing.
100. When conducting component checks use a test pressure between +7 mbar and +10 mbar with a max pressure loss of 1 mbar/min.

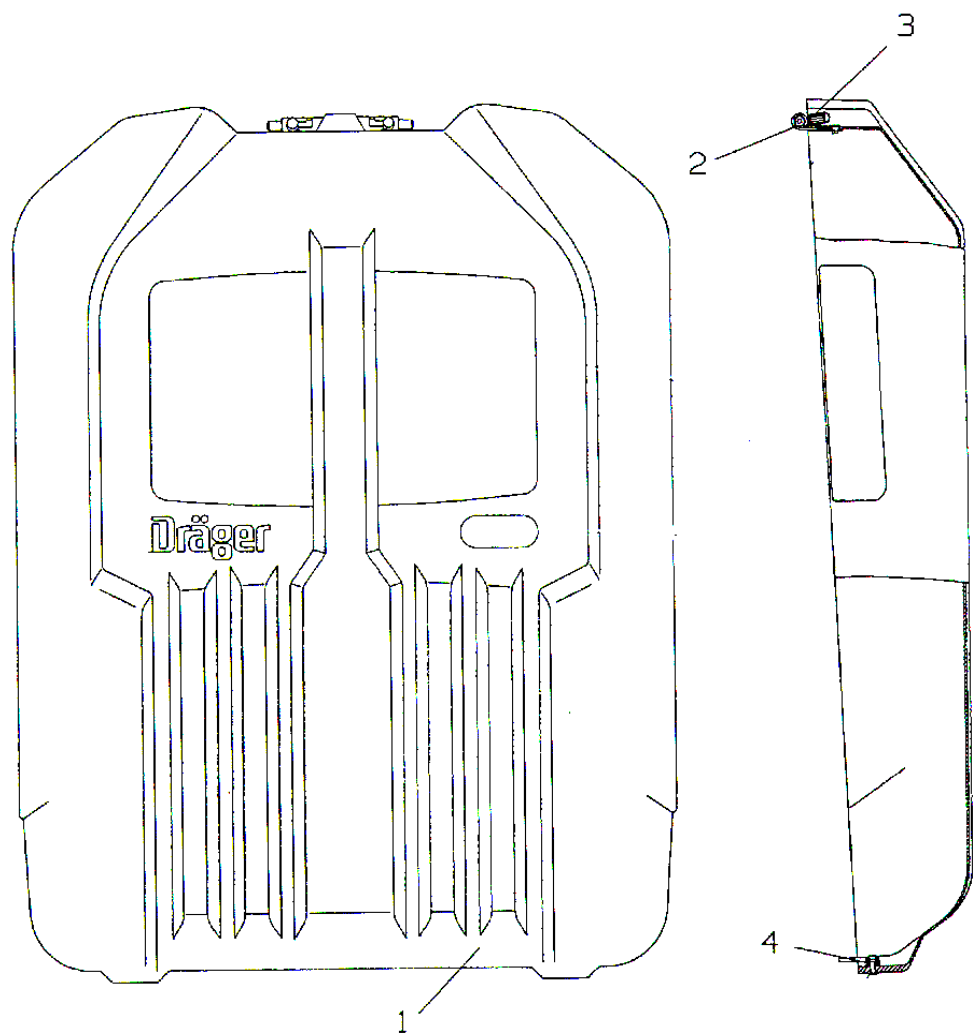


## BG - 4



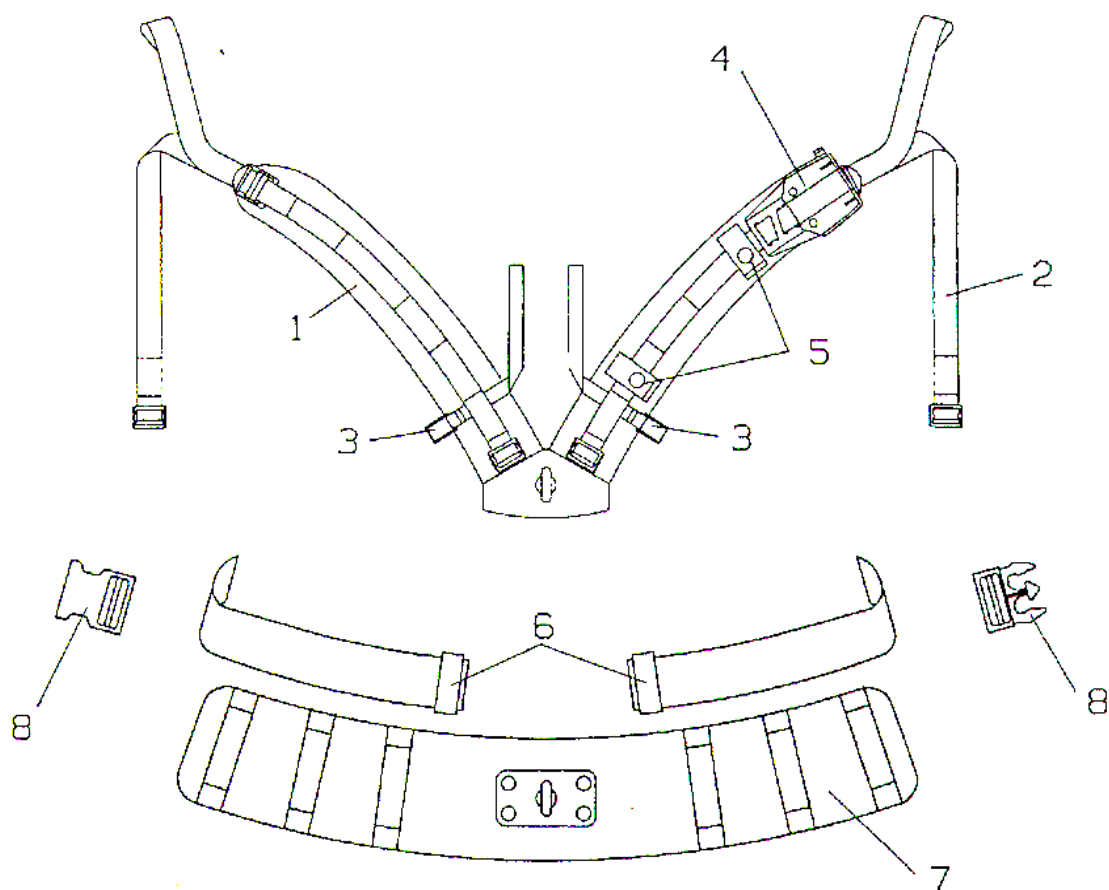
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Carrying Housing	12	Breathing Bag
2	Cover Shell , complete	15	Lever, Complete
3	Shoulder Pad Assembly	16	CO2 Absorber
5	Cooler	17	Pressure Reducer BG4
6	Excess Pressure valve, Complete	19	Oxygen Cylinder
7	Minimum Valve	21	Distribution Hose
8	Drain Valve	22	Panorama Nova Mask
9	Display Unit		
10	Basic Unit AP		
11	Sensor Unit		

Cover



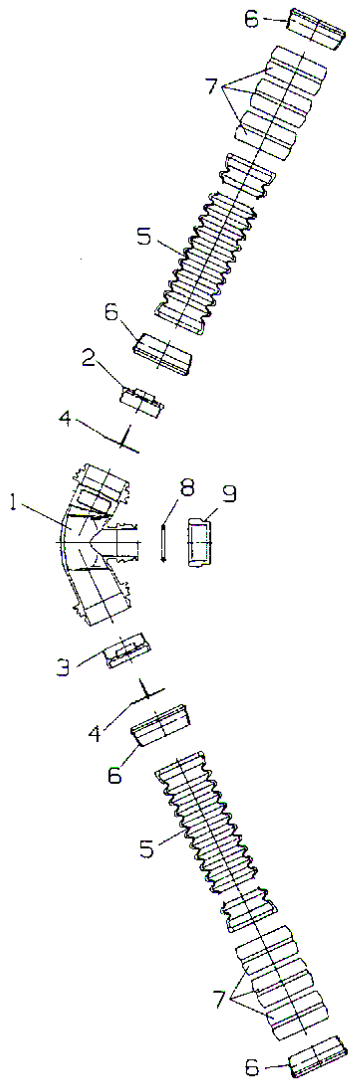
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Cover Shell	3	Grip Cap
2	Hinge	4	Button

## Harness Assembly



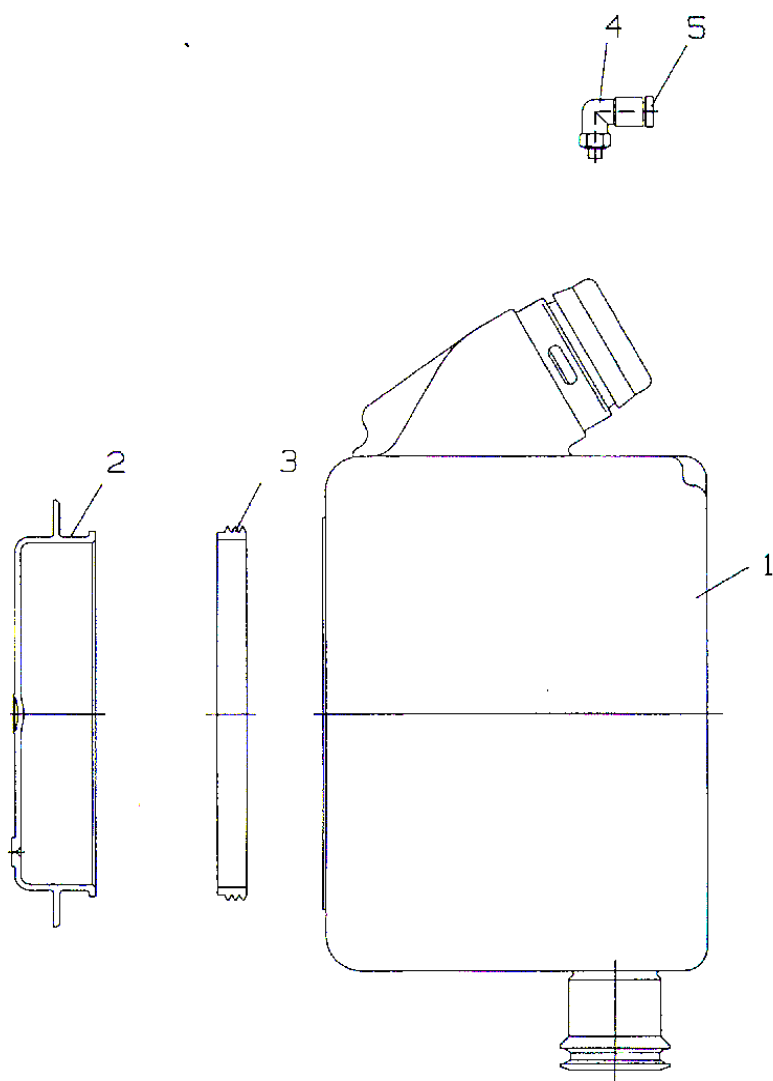
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Shoulder Pad Assembly	5	Hose Clip
2	Shoulder Adjusting Strap	6	Waistbelt without Buckle
3	Hose Holder	7	Waistbelt Pad
4	Holder	8	Buckle Set

Breathing Hose Assembly



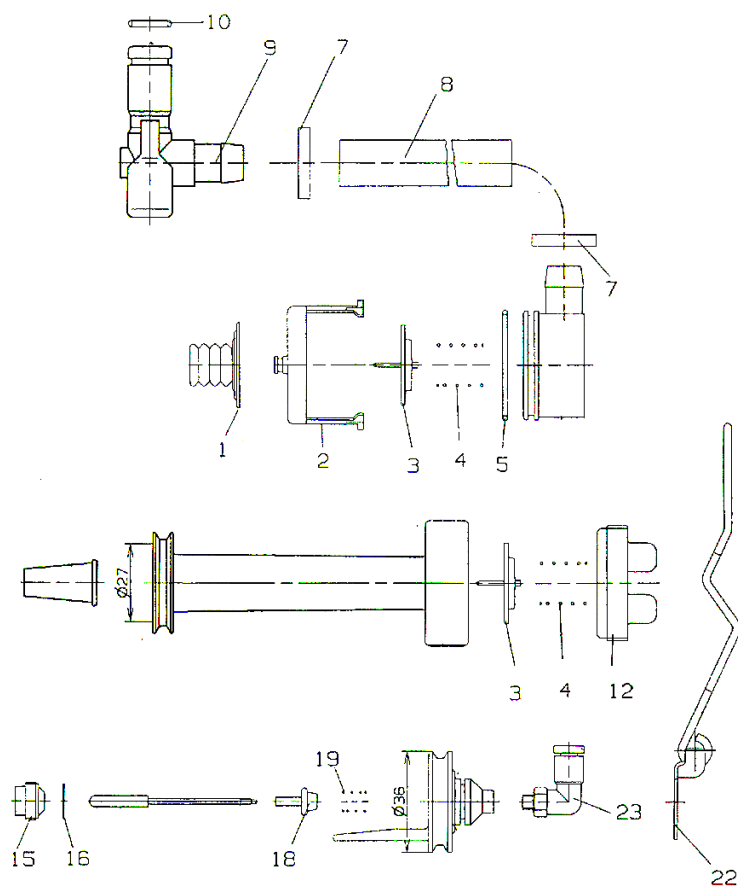
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Coupling	6	Bayonet Ring
2	Inhalation Valve Seat	7	Hose Holder
3	Exhalation Valve Seat	8	Toroidal Sealing Ring
4	Valve Disc	9	Plug
5	Corrugated Hose		

## Cooling Canister



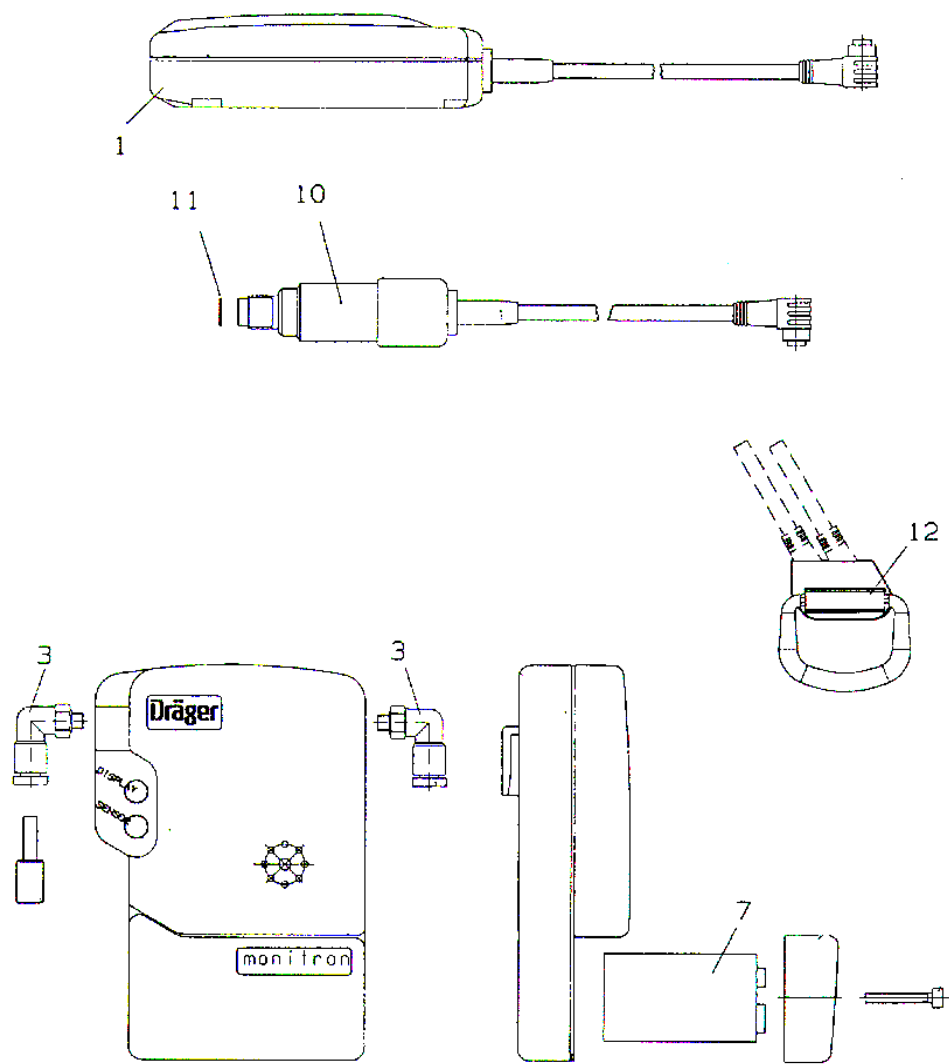
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Cooler	4	Angle Connector
2	Cover for Cooler	5	Reaction Ring
3	Gasket		

## Drain / Relief / Minimum Valve Assembly



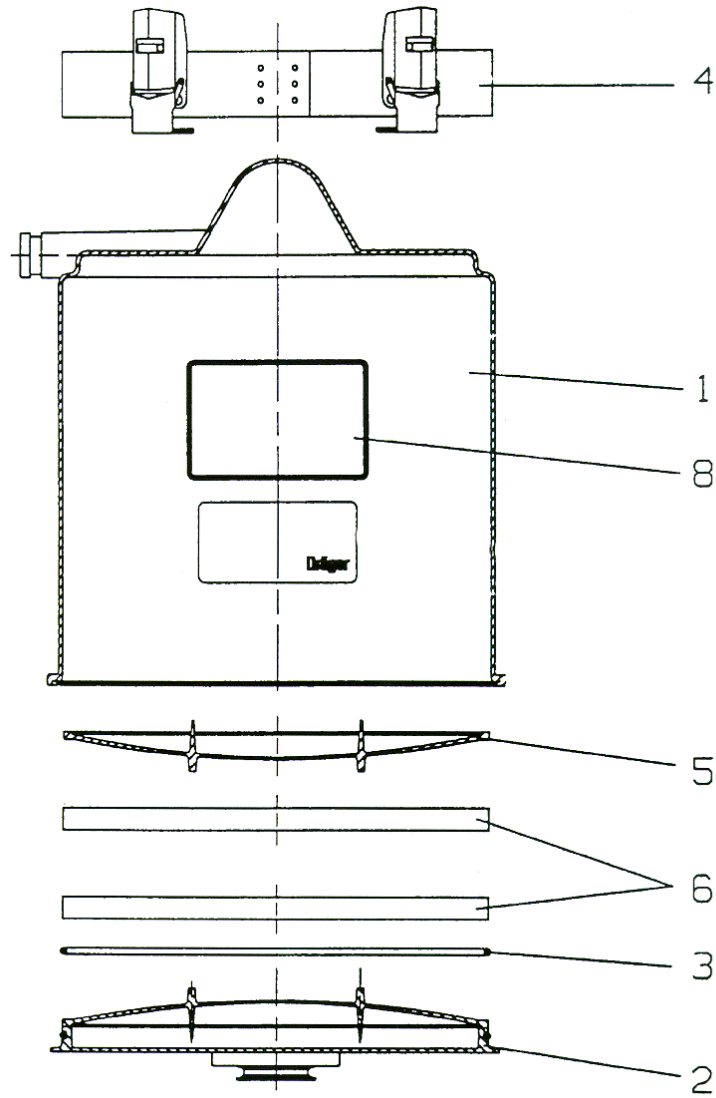
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Valve Disc	12	Cap
2	Crater Case	15	Valve Crater
3	Valve Disc	16	Washer
4	Relief / Drain Valve Spring	18	Valve Plate
5	O-Ring	19	Spring
7	Clamp Fitting	22	Clamp, Minimum Valve
8	Hose	23	Angle Connector
9	Coupling		
10	O-Ring		

# Monitron



1	2	1	2
Cons. No.	Designation	Cons. No.	Designation
1	Display Unit	10	Sensor Unit
3	Angle Connector	11	Copper Ring
7	9 volt battery	12	Angled Sensor Connector

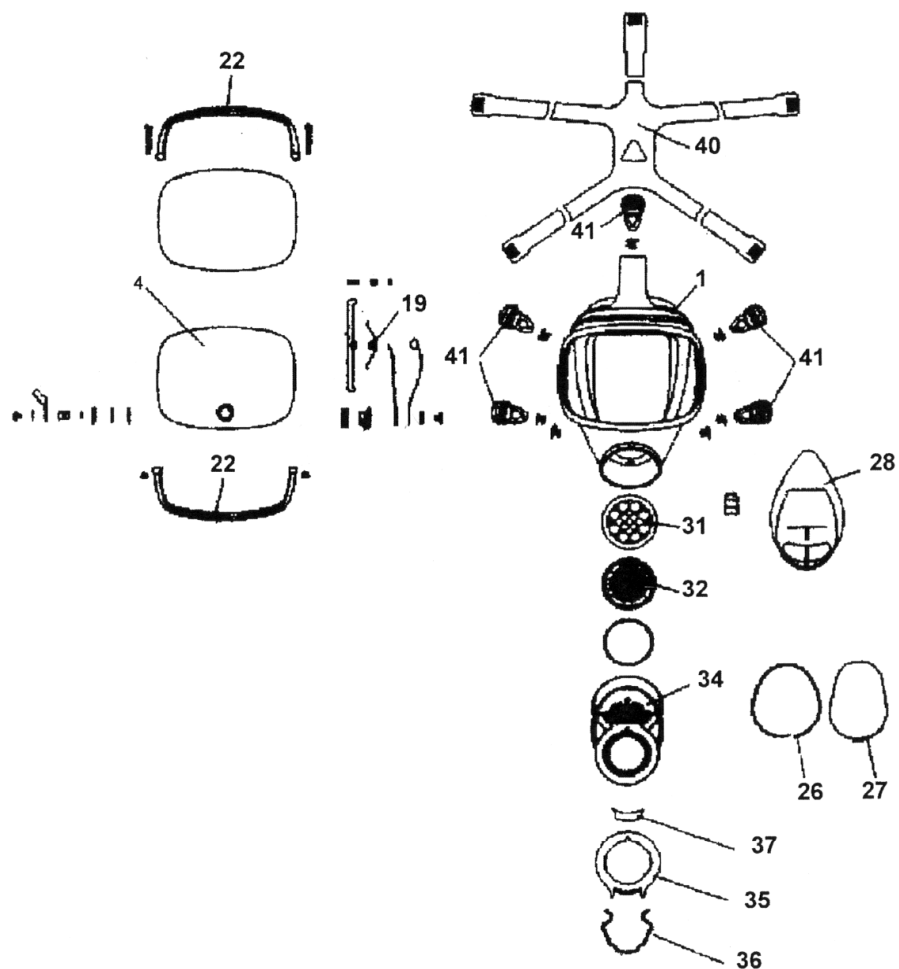
## Reusable Cartridge



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1-8	Reusable Cartridge	5	Refillable Scrubber Screen
2	Lid	6	Filler Mats
3	Seal, Refill Cartridge	8	NIOSH Approval Label
4	Strap with Tension Spring Hook		

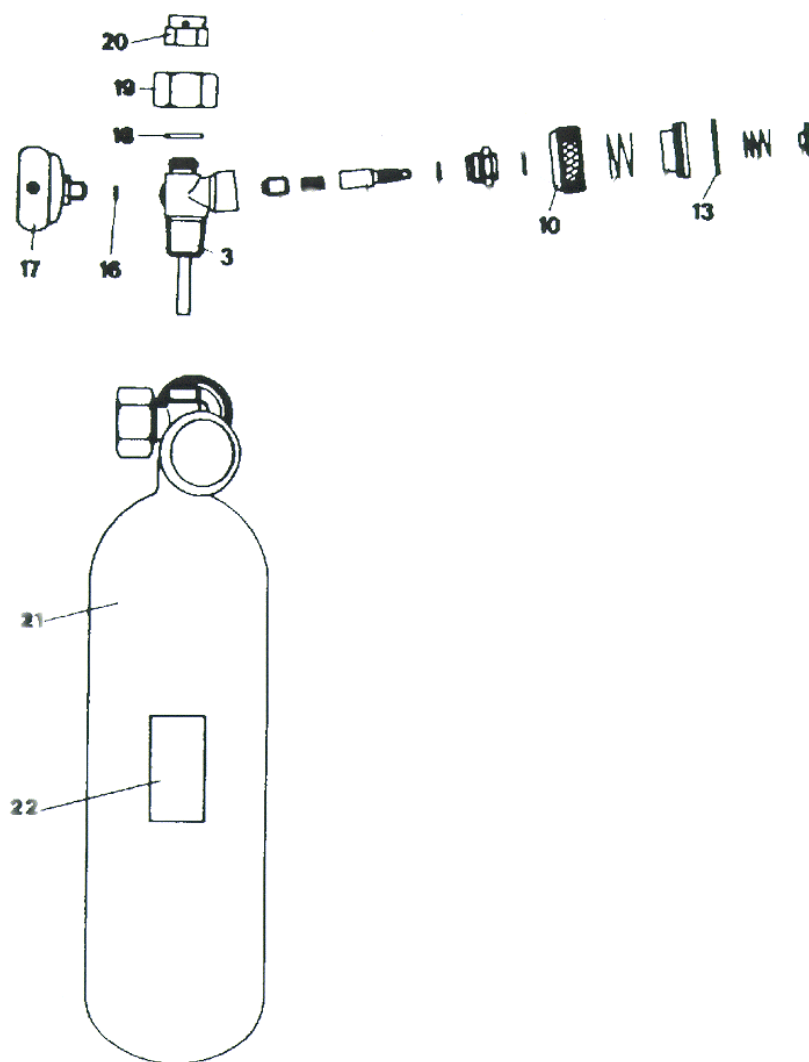


## Panorama Nova EPDM Mask



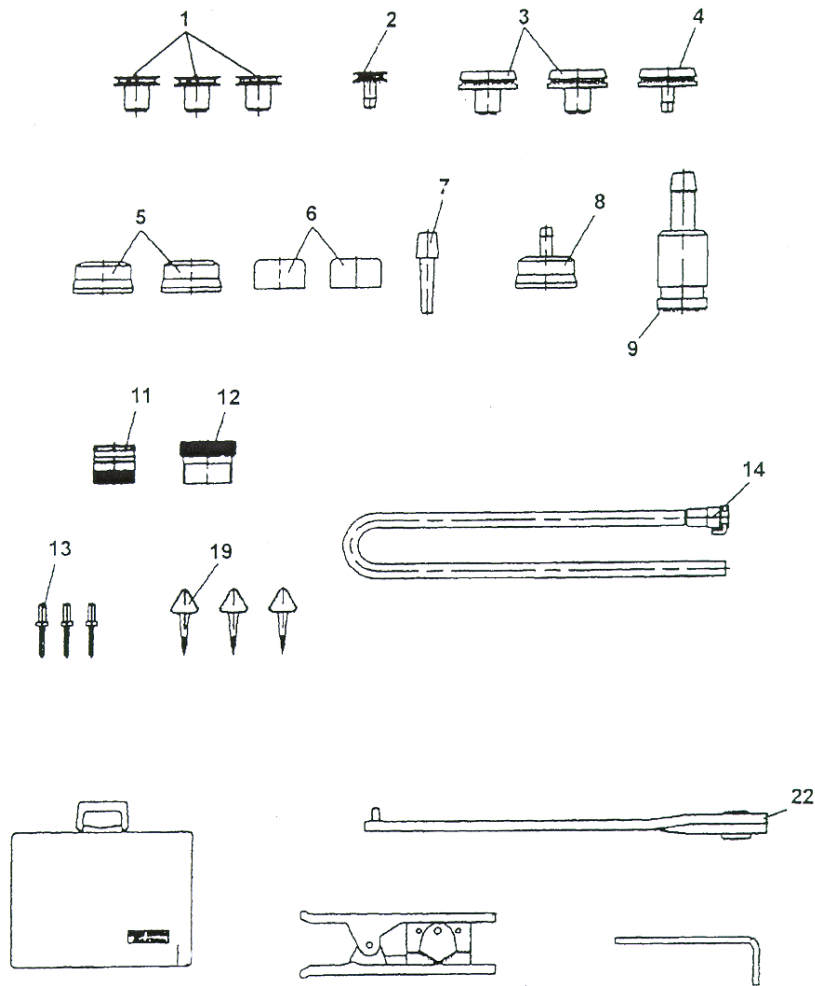
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Mask Body EPDM	32	Speech Diaphragm
4	Lens, Wiper, BG Mask	34	Connecting Piece
19	Tension Bar	35	Housing
22	Frame	36	Spring
26	Sliding Ring	37	Key
27	Clamp	40	Head Strap
28	Inner Mask, EPDM	41	Roller Buckle
31	Retainer		

## Oxygen Cylinder



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
3	Valve Housing	18	Lock Washer
10	Hand-wheel	19	Lock Nut
13	Safety Ring	20	Bursting Disc
16	Sealing Ring	21	Oxygen Cylinder
17	Manometer	22	Label

## Test Kit



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Plug For Breathing Bag	9	Test Connection for Control Valve
2	Nozzle For Breathing Bag	11	Sealing Plug for Mask
3	Sealing Plug (Corrugated Hose)	12	Test Piece
4	Test Socket for Corrugated Hose	13	Sealing Plug for Plug In Conn.
5	Sealing Cap for Corrugated Hose	14	Test Hose/Metering Control
6	Sealing Cap	19	Sealing Ring Lifters
7	Testing Plug	22	Face Spanner
8	Test Cap for Corrugated Hose		

***SECTION V***

***BENCH***

***BIOPAK 240-S***

# 2005 BENCH BIOPAK 240-S CONTEST RULES

## INDEX

### Section V

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## **RULES GOVERNING 2005 BENCH BIOPAK 240-S CONTEST AND INTERPRETATIONS OF DISCOUNT CARDS**

1. Each participant must be under guard before the start of the Contest in a location assigned by the Chief Judge and must remain continuously under guard until time to work the problem. Participants under guard must be in a location where they will be unable to obtain any information concerning the problem to be worked. Any participant receiving information concerning a Contest problem prior to starting to work the problem will be disqualified by the Chief Judge and the Assistant Chief Judge. No person, except guards and Contest officials assigned to give the written examination, will be allowed to communicate with any participant under guard. Those who have performed will not be permitted to communicate with any participant awaiting their turn to perform.
2. Any indication of receiving unauthorized information during the working of the problem may result in disqualification as determined by the Chief Judge and the Assistant Chief Judge. No one except judges, Contest officials, and working participants will be permitted in the work area, unless special approval is given by the Chief Judge. Communication with bench participants, except for the judges, is prohibited. News media and photographers who wish to be in the working area must receive permission from the Director and be accompanied by a Contest official.
3. Any bench participant not in place and ready at the time specified will be disqualified from the Contest.
4. The bench participant will be provided with two BIOPAK 240-S apparatus (one disassembled, one assembled), a Test kit, a stopwatch, defogging solution, leak detector fluid and a tool kit. Only the tools and fluid provided will be used for testing and assembly of the apparatus. The work at the bench will consist of (1) a visual examination of a disassembled BIOPAK 240-S and the proper assembly and preparation for use in rescue work. This will include correcting any predetermined problem(s) so that the apparatus is in proper working order. Simulating defogging of the facepiece lens will be done as part of the visual examination. This visual examination, correcting predetermined problem(s), and proper assembly can be done at any time allowed for working of the problem. (2) Test the assembled BIOPAK 240-S apparatus with a Test kit, and correct the predetermined problem(s) so that the apparatus is in proper working condition. Except for removing the coupler from the breathing hoses, the assembled BIOPAK 240-S apparatus cannot be disassembled to look for problems, until the High pressure leak test

is started. When testing is completed on the assembled BIOPAK 240-S apparatus, the hoses shall be removed from the tester, connected to the facepiece, and the upper housing installed. This shall be done before the clock is stopped.

5. Spare parts to correct the predetermined problem(s) will be provided once the bench participant has specifically identified the problem. This will require the participant to point out the exact location of the deficiency. (Example: High pressure leak in circuit. Participant will identify the location of the leak.)
6. When an unplanned deficiency is encountered with the apparatus, the participant will be notified by the judges that the deficiency is not part of the problem. The judge will stop the clock, and any time used to correct the deficiency will not be charged to the working time. However, the process of verbal elimination shall not be used by the bench participant to find the predetermined problem(s). If it becomes obvious to the judges that this is occurring, the first offense will result in a warning, the second offense a discount, and the third offense could result in disqualification as determined by the Chief Judge. (Example: Participant verbally identifies a deficiency with every part of the facepiece when only one predetermined problem exists.)
7. The bench participant will not be allowed to bring any materials, written information, or records to the work site. The participant will not have to create a test record; however, he or she may write the test from memory on paper that will be provided for that purpose after the official working time has started.
8. Tests will be performed in sequence on the assembled BIOPAK 240-S apparatus using the standard test procedures with the Test kit as outlined in the BIOPAK Model 240-S Benchman Manual, A46D030, Revision: E.
9. A maximum of 30 minutes will be allowed to complete the problem. The bench judge will inform the participant when he has one minute remaining to work the problem. At the completion of the problem, the judge(s) and the participant will note the working time of the problem with the official timekeeper. Work done after the clock is stopped will not be recognized.
10. Manually abusing or intentionally over or under pressurizing the Balloon Leak Test Fixture substantially will be considered abusing the equipment. If the participant is observed abusing the Test kit, the first offense will result in a warning, the second offense will result in a discount, and the third offense could result in disqualification as determined by the Chief Judge.

A. Written Examination of Bench Participant

1. The written examination shall consist of 30 questions. Twenty questions for the written examination will be taken verbatim from the Statements of Fact which will be fill in the blank and each blank shall represent a key word with no more than three blanks per statement. Ten questions will be taken verbatim from identification of parts. Thirty minutes will be allowed for the written examination.
2. In special circumstances, individual bench participants may be given oral instead of written examinations by at least two judges. Requests for consideration shall be presented to the Director of the Contest at the time of registration.
3. Bench participants will be separated to the extent possible, and every effort will be made to prohibit discussion of questions and answers among the bench participants.

B. Miscellaneous

1. In the event of ties in the Bench Contest, the number of discounts at bench will be the first tie breaker; the number of discounts on written examination will be the second tie breaker; and the official working time at bench in minutes and seconds will be the third tie breaker.
2. The bench participant and trainer will report to a designated location to review and prepare protests within one hour of notification. Twenty minutes will be given to review and prepare written protests. All protests will be considered by the Chief Judge and his/her Assistant and their decision will be binding.
3. Bench participants must be bonafide employees of the mining industry or members of mine rescue teams designated to fulfill the requirements of 30 CFR Part 49. This does not exclude bench participants whose team is not participating at the National Contest.
4. Disputes with regard to the Bench Contest (except discounts), shall be immediately filed with the Director. Disputes filed shall be in writing and set forth incidents, times, names source of information and act complained against. Complainant shall remain accessible to the Director until the complaint is resolved. A decision by the Director shall be final.



## Interpretations of Discount Sheet

### A. Written Examination

1. For each incorrect answer\_\_\_\_\_1

### B. Time

The time will be recorded in minutes and seconds.

### C. Competition at Bench

1. Failure to verbally identify each test being conducted\_\_\_\_\_2

Verbally identify each test being performed.

2. Failure to verbally identify each problem\_\_\_\_\_5

Failure to verbally identify is also interpreted as failure to find the problem.

3. Failure to correct each problem\_\_\_\_\_5

The bench participant shall properly correct the problem and continue with the proper tests. Once a bench participant finds a predetermined problem and does not correct it before continuing with the remaining tests, he/she shall receive a five point discount for continuing without correcting the problem and a pending five point discount for failing to correct the problem. If all of the remaining tests are properly conducted and passed and the participant returns to the uncorrected problem and corrects it, the pending five point discount will not be assessed. Should the participant continue on from this point and properly conduct all of the remaining tests again, he/she would also have the original five point discount for continuing tests removed.

4. Failure to conduct any visual examination or test on the BIOPAK 240-S, each test\_\_\_\_\_5

5. Failure to tighten connections properly during assembly or testing, each connection\_\_\_\_\_1

All connections must be tightened on the apparatus and verbally identified as hand tight or wrench tight at the time the connection is tightened. Failure to verbally identify at the time the connection is being tightened will result in a one point discount for each.

This includes:

- . Vent Valve Secondary Body - hand tight
  - . Vent Valve Primary - hand tight
  - . Diaphragm Worm Gear Clamp - wrench tight
  - . Constant Add Restrictor Fitting - wrench tight
  - . Breathing Hose Worm Gear Clamps - wrench tight
  - . Tube quick Disconnect Fittings - hand tight
  - . Canister End Cap to Coolant Canister Body - hand tight
  - . Cylinder connections - hand tight
  - . Hose connections to facepiece hose adapters - hand tight
  - . Hose Adapter fitting to Facepiece Assembly - hand tight
  - . Test fixture connections - hand tight
6. Failure to comply with rules not covered in discount sheet, each infraction\_\_\_\_\_2

If the discount is not listed on the discount sheet, and if it is not covered under one of the approved rules of the Contest, do not improvise a discount to cover the suspected violation.

D. Visuals

1. Failure to conduct a proper visual examination of the Upper and Lower Housing / harness\_\_\_\_\_1

The visual examination will include an examination of the harness assembly, lower housing, upper housing, visible sealing rings, external gage, O<sub>2</sub> regulator, and warning whistle. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

2. Failure to conduct a proper visual examination of the Breathing Chamber Assembly\_\_\_\_\_1

The participant will verbally identify that the diaphragm is being examined for pliability and signs of deterioration. The participant will verbally identify that the o-ring and sealing edges are being examined for signs of deterioration. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 2 points)

3. Failure to conduct a proper visual examination of the O<sub>2</sub> cylinder\_\_\_\_\_1

A proper cylinder examination includes a visual inspection of the cylinder. The participant will verbally identify the cylinder pressure on the gage, the pressure rating on cylinder, the hydrostatic test date, and identify if the cylinder is plus rated. Participant will inform the judge if the cylinder pressure is less than 2,700 PSI. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

4. Failure to conduct a proper visual examination of the carbon dioxide scrubber\_\_\_\_\_1

A proper examination includes a visual inspection for dents and defects. Damage and proper lubrication of O-ring seals, foam pad thickness and adequate coverage of the canister. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 3 points)

5. Failure to conduct a proper visual examination of the coolant canister assembly\_\_\_\_\_1

The visual examination will include an examination of the canister for damage and defects, o-ring seal, foam moisture absorbent pad and a gelpak freeze form. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 2 points)

6. Failure to conduct a proper visual examination of the facepiece\_\_\_\_\_1

The visual examination will include an examination of the head strap assembly, mask body (including sealing edges), the lens, speaking diaphragm, wiper or anti-fog lens insert, and inner nose cup. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 4 points)

7. Failure to conduct a proper visual examination of the hoses\_\_\_\_\_1

The participant will verbally identify that the hoses are being inspected for pliability and signs of deterioration. Stretching or manipulating the hoses with a massaging action will be part of this examination. The participant will verbally identify that the sealing edges, including the seal on the adapter assembly, are being examined for signs of deterioration. Failure to examine and verbally identify the examination will result in one discount for each. (Maximum 2 points)

E. Tester

1. Failure to conduct the proper high pressure leak test\_\_\_\_\_2

Verify that breathing hoses are connected together with the hose coupler fitting. Remove breathing chamber lid and CO2 scrubber. Wedge a wooden tongue depressor in one of the slots along the edge of the breathing chamber to push the diaphragm away from the internal breathing well. Open O2 cylinder valve. Check each plumbing joint with leak tec, allowing the solution to sit for a minimum of one minute and then visually inspect each joint for signs of constant bubble formation.

2. Failure to conduct a proper constant flow test\_\_\_\_\_2

Slide a test flow meter over the demand valve housing located in the center of the breathing chamber well. Wedge a wooden tongue depressor in one of the slots along the edge of the breathing chamber to push the diaphragm away from the internal breathing well. Open O2 cylinder valve. The flow reading on the flow meter should be between 1.64 and 2.4 Lpm. Participant will verbally state flow reading. Close O2 cylinder valve.

3. Failure to conduct a proper low pressure leak test\_\_\_\_\_2

Remove the hose coupler fitting and connect the hoses to the leak test fixture. Insert a test key into the slotted hole on the rear of the lower housing and turn the key 1/4 turn to lock into position. Open O2 cylinder valve, and use the bypass valve to inflate the balloon of the test fixture to an approximate 45 degree angle. If the balloon over inflates it can be vented through the vent valve of the fixture. Close the oxygen cylinder valve and depress the bypass valve to vent the internal pressure of the Biopak. Observe the test balloon for a period of 2 minutes. Disconnect the test fixture and reconnect breathing hoses with the hose coupler. Remove the test key from the rear of the Biopak.

**STATEMENTS OF FACT  
BENCH BIOPAK 240-S CONTEST**

1. Do not allow oil, grease or other combustible materials to come in contact with the oxygen cylinder or cylinder valve to prevent ignition.
2. The Biopak 240-S is approved for respiratory protection at temperatures above 15 degrees F.
3. The exhalation breathing hose is a flexible hose that will transfer user exhalation from the mask and into the breathing chamber.
4. The breathing chamber provides carbon dioxide absorption, positive pressure, and maintains system volumetric control through venting and adding oxygen.
5. The anti-anoxia valve is simply a plug that will restrict the exhalation hose connection to the breathing chamber in the event oxygen stores have not been installed or activated in the respirator.
6. The diaphragm and spring combine to form the counter-lung.
7. The demand valve is a mechanically actuated valve located at the upper end of the diaphragm inhalation travel stroke.
8. The demand valve insures that the respirator will supply the user with additional oxygen as required and will also insure against the respirator going into a negative pressure situation.
9. The flow restrictor admits a constant flow of oxygen at 1.78 Lpm.
10. The coolant canister is a housing that contains a frozen gel tube or pack.
11. Breathing gas enters the cooler at approximately 120 degrees F.
12. The frozen gel in the coolant canister will absorb much of the breathing gas heat to maintain the gas temperature below 90 degrees F.
13. The inhalation breathing hose is a flexible hose that will transfer carbon dioxide-free, cooled and condensed breathing air from the coolant canister into the inhalation port of the facepiece.

14. The oxygen cylinder is a carbon composite wrapped, aluminum lined, DOT approved pressure vessel.
15. The oxygen cylinder will hold 21 cubic feet of oxygen compressed to 3000 psi when fully charged.
16. The oxygen cylinder requires hydrostatic testing every 3 years.
17. The oxygen cylinder shall only be charged with U.S.P. medical grade 100% oxygen.
18. The pressure regulating mechanism will reduce the high pressure of the oxygen cylinder to approximately 260 psig.
19. Low pressure plumbing includes the bypass valve, alarm whistle and associated small diameter tubing.
20. The alarm whistle will provide a 92 dB audible signal for 45-60 seconds whenever remaining oxygen stores are 25% of full capacity.
21. The Turn-Around Maintenance Tag provides an indication of completed procedures and inspections for user verification before Biopak uses.
22. Only use disinfectant agent that does not contain alcohol or chlorine that can deteriorate facepiece lens and rubber components.
23. Do not totally submerge the breathing chamber into the disinfectant solution to avoid contact of solution with the demand housing flow restrictor.
24. Oxygen cylinders that have a pressure gauge reading of 0 psig must be purged and pulled into a vacuum to remove all traces of moisture before filling.
25. Oxygen cylinder storage temperature should be maintained as close as possible to 70 degrees F at all times.
26. The GelPac or Cool Tube is to be placed into a freezer for at least 8 hours at a temperature between -15 degree F (-10 C) and 15 degree F (-26 C).
27. When conducting a Flow Test verify a flow reading of at least 1.64 lpm.

28. Use only LIMEPAC absorbent agent to refill the scrubber canister.
29. Do not expose the absorbent material to the ambient atmosphere for more than a total of 1 hour during recharging and/or servicing.
30. Carbon dioxide absorbent material has a shelf life of 5 years when sealed in its shipping container.
31. Once the shipping container seal is broken the shelf life of the absorbent is reduced to 1 year.
32. Replace any scrubber foam pad that is less than 1/8 inch thick over the absorbent coverage area or 1/32 inch thick on the outside diameter.
33. Any scrubber foam pad that does not overlap the outer edge of the canister body should be replaced.
34. The large o-ring located on the inside diameter of the breathing chamber should be lightly greased with Dow-111.
35. The large o-ring located on the outside diameter of the breathing chamber should be lightly greased with Dow-111.
36. Use anti-fog cloths to apply a heavy coat of anti-fog agent onto the exposed inside surface of the facepiece lens and/or anti-fog lens.
37. The chest mounted pressure gauge should have the same reading as the cylinder gauge after 90 seconds.
38. The oxygen cylinder pressure should be between 2700 and 3000 psig for the Biopak 240-S to be ready for use.
39. Leak-Tec solution should be used to check plumbing connections on the Biopak 240-S.
40. When performing High Pressure Leak Testing Leak-Tec solution should be allowed to sit for a minimum of one minute then visually inspected for signs of constant bubble formation.
41. Severe over inflation of the test balloon can cause damage to the balloon itself and to the vent valve of the breathing chamber.

42. If the test key is left in the Biopak 240-S it will result in excessively high breathing resistance, improper function and may damage the diaphragm of the breathing chamber.
43. The Carbon Dioxide Scrubber Foam Pad should be replaced after 20 uses.
44. The Facepiece Anti-Fog insert should be replaced after 20 uses.
45. The Oxygen Cylinder Sealing Washer should be replaced after 50 uses.
46. The Breathing Chamber ID O-Ring should be replaced after 50 uses.
47. The Breathing Chamber OD O-Ring should be replaced after 50 uses.
48. The Coolant Canister End Cap O-Ring should be replaced after 50 uses.
49. Do not attempt to lubricate an o-ring while it remains in its seat.
50. Although the oxygen cylinder sealing washer serves the same purpose as an o-ring it should never be lubricated.
51. The BIOPAK 240-S breathing apparatus has several face piece assemblies approved for their unit.
52. Only use Cristo-Lube on the o-rings located in the following locations:  
Bypass Valve  
Alarm Whistle Assembly  
Flow Restrictor O-Ring Seal  
Connector Tube O-Ring Seal
53. The regulator assembly can not be serviced or repaired in the field.
54. The Biopak 240-S weighs 35 pounds when fully charged and ready for use.
55. Red visual indication on chest mounted pressure gauge to indicate 25% of rated duration, approximately 1 hour remaining.
56. Lower housing style must match upper style in terms of latch type.
57. The 1/8 inch Tube Quick Disconnect Fitting-Red shall have release mechanism locked into position with a cable tie.

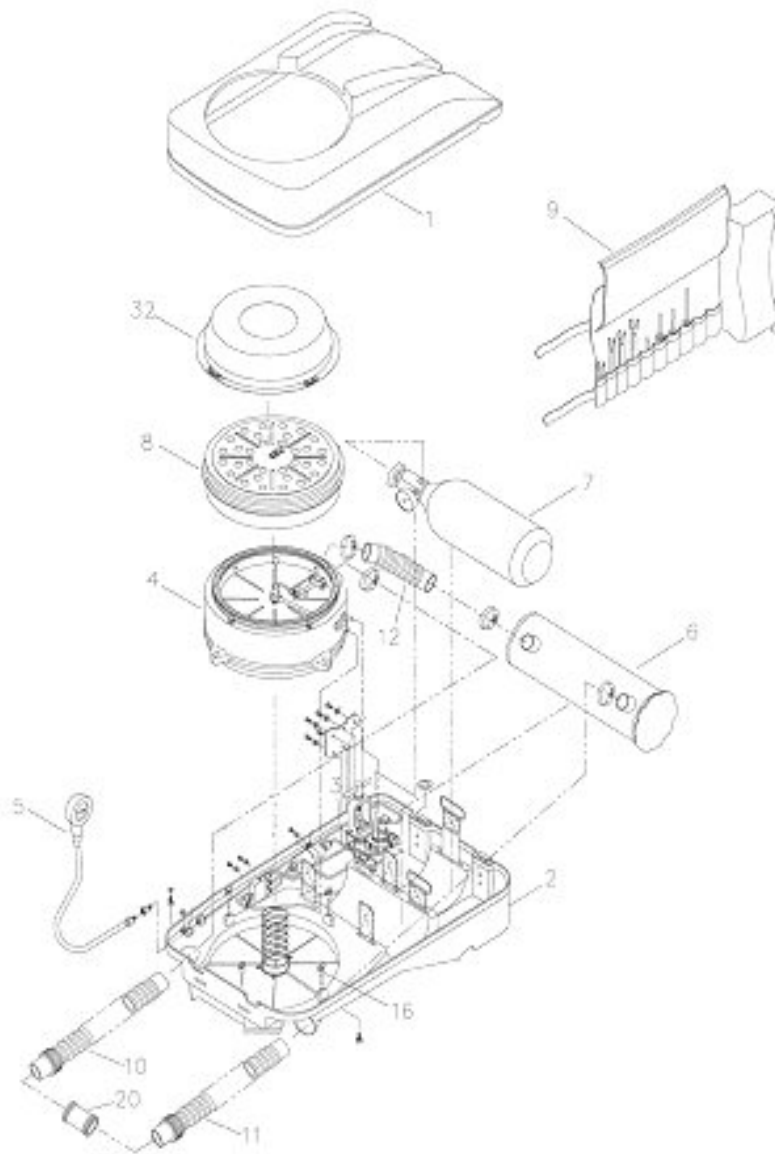


58. The 5/32inch Tube Quick Disconnect Fitting-Brass shall have release mechanism locked into position with a cable tie.
59. The vent valve primary spring is silver in color.
60. The vent valve secondary spring is red in color.
61. One keg of carbon dioxide absorbent will provide approximately 11 fills.
62. The inhalation hose is marked with a nylon 8 inch green cable tie.
63. The exhalation hose is marked with a nylon 8 inch red cable tie.
64. The oxygen cylinder has a standard or extended handle option.
65. All users of the Biopak 240-S must be trained by qualified instructors in donning, operation, inspection and emergency use procedures.
66. Prior to using the Biopak 240-S it must be determined that the user is medically fit.
67. Use the Biopak 240-S with adequate skin protection when worn in gases or vapors that poison by skin absorption.
68. Metabolic consumption rate of oxygen at a moderate work load is 1.0 to 1.5 lpm.
69. Before removing the oxygen cylinder, verify that the cylinder valve is closed, chest gauge reads 0 psi, and depress bypass valve to relieve any internal pressure.
70. The breathing chamber is held in place with 4 pushpins.
71. Parts should remain in the disinfecting solution for a minimum of ten minutes.
72. Do not wash and disinfect the carbon dioxide scrubber components until after washing all other components to avoid contact of absorbent granules.
73. Cuts in the outer wrapping of the oxygen cylinder require hydrostatic testing at a test facility.

74. Special effort should be made to prevent oxygen cylinders from being drained below 500psig to reduce the possibility of external contamination migration into the cylinder.
75. Probable causes of the mask fogging during use are the Anti-Fog lens insert not installed or damaged, or Anti-Fog agent not applied or applied incorrectly.
76. Probable cause of apparatus not achieving 4-hour duration could be a poor or leaking facepiece seal.
77. Probable cause of apparatus not achieving 4-hour duration could be a Pressure Reducer Failure.
78. Probable cause of apparatus not achieving 4-hour duration could be a leak in the Biopak 240-S.
79. Probable cause of high breathing resistance during exhalation could be facepiece exhalation valve sticking closed.
80. Probable cause of high breathing resistance during exhalation could be the diaphragm spring in breathing chamber is not properly seated or damaged.
81. Probable cause of high breathing resistance during exhalation could be the vent valve in the breathing chamber not opening properly.
82. Probable cause of high breathing resistance during inhalation could be facepiece inhalation check valve sticking closed.
83. Probable cause of high breathing resistance during inhalation could be diaphragm spring in breathing chamber is missing or damaged.
84. Probable cause of high breathing resistance during inhalation could be demand valve in breathing chamber has failed.
85. If the Anti-Anoxia valve in the breathing chamber is not operating properly it could cause high breathing resistance during exhalation or inhalation.
86. Probable cause of breathing gas uncomfortably warm during use could be frozen coolant insert has not been installed into the coolant canister.
87. Probable cause of facepiece failing positive and/or negative testing during user donning could be inhalation or exhalation check valve failure in the facepiece.

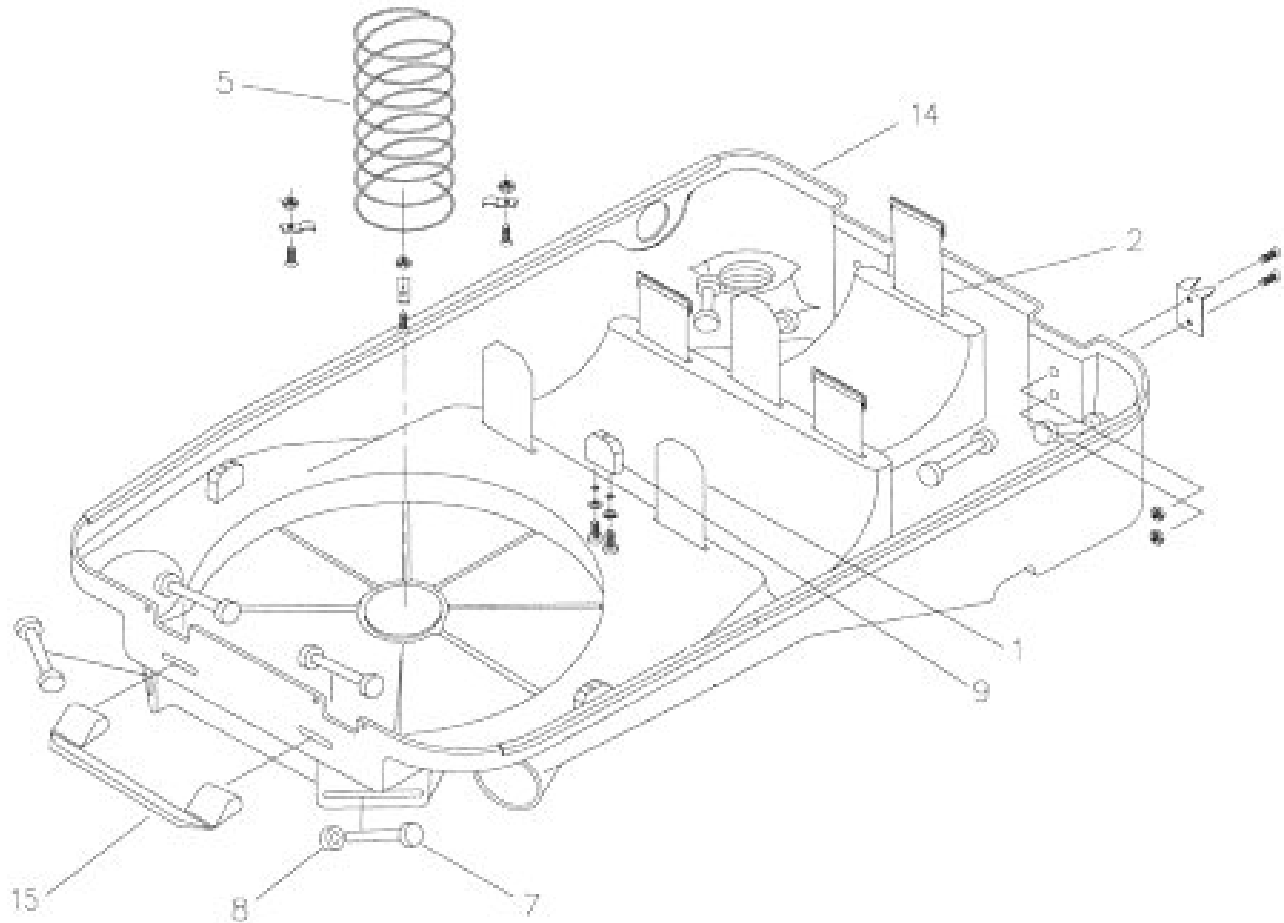
88. Probable cause of Biopak 240-S failing leak testing could be component connections loose.
89. Probable cause of Biopak 240-S failing leak testing could be a system leak.
90. Probable cause of Biopak 240-S failing flow test could be the flow restrictor in the breathing chamber has clogged.
91. Probable cause of Biopak 240-S failing flow test could be the demand valve of the breathing chamber has failed.
92. Probable cause of Biopak 240-S failing flow test could be the pressure regulator has failed.
93. Probable cause of sounds of escaping gas heard during use could be poor facepiece fit.
94. Probable cause of sounds of escaping gas heard during use could be that the sealing washer between the oxygen cylinder and the pressure regulator is missing or damaged.
95. Probable cause of sounds of escaping gas heard during use could be that the Biopak 240-S has a leak in the breathing loop or the high or low pressure plumbing systems.
96. Probable cause of alarm indications of remaining service time not functioning correctly could be the chest mounted pressure gauge has failed or pressure line has been severed.
97. Probable cause of alarm indications of remaining service time not functioning correctly could be that the alarm whistle requires tone adjustment.
98. Probable cause of alarm indications of remaining service time not functioning correctly could be that the alarm whistle has failed.
99. Probable cause of breathing gas uncomfortably warm during use could be that the user is working in high ambient temperatures.
100. Probable cause of apparatus not achieving 4-hour duration could be that the bypass valve is utilized to clear facepiece lens or used excessively.

## Biopak - 240-S



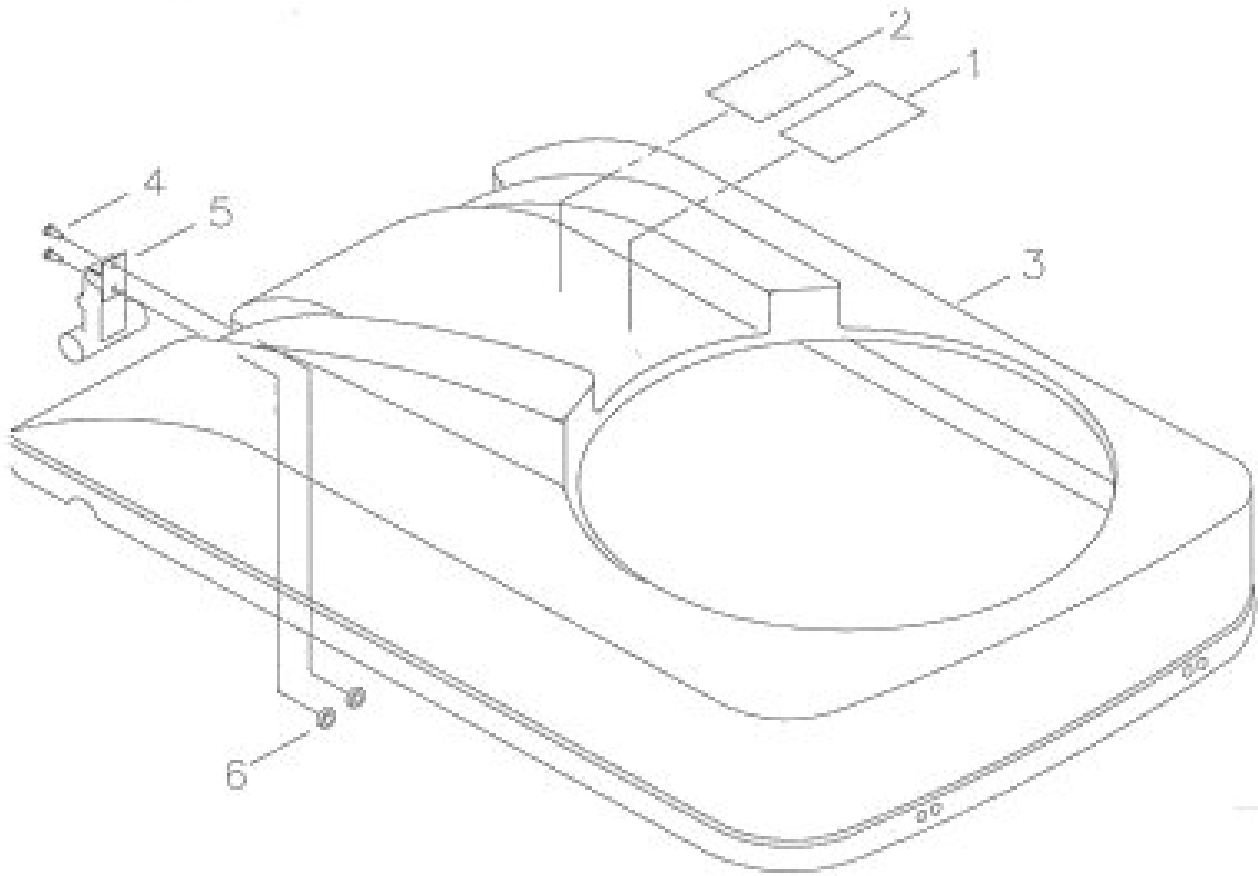
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Upper Housing Assembly	9	Toolkit Assembly
2	Lower Housing Assembly	10	Exhalation Breathing Hose Assembly
3	Pneumatics Assembly	11	Inhalation Breathing Hose Assembly
4	Breathing Chamber Assembly	12	Connection Hose Assembly
5	Chest Mounted Pressure Gauge Assembly	16	Breathing Chamber Lock-down Pin
6	Coolant Canister Assembly	20	Breathing Hose Coupler Fitting
7	Oxygen Cylinder Assembly	32	Breathing Chamber Cover
8	Carbon Dioxide Scrubber Assembly		

## Lower Housing Assembling



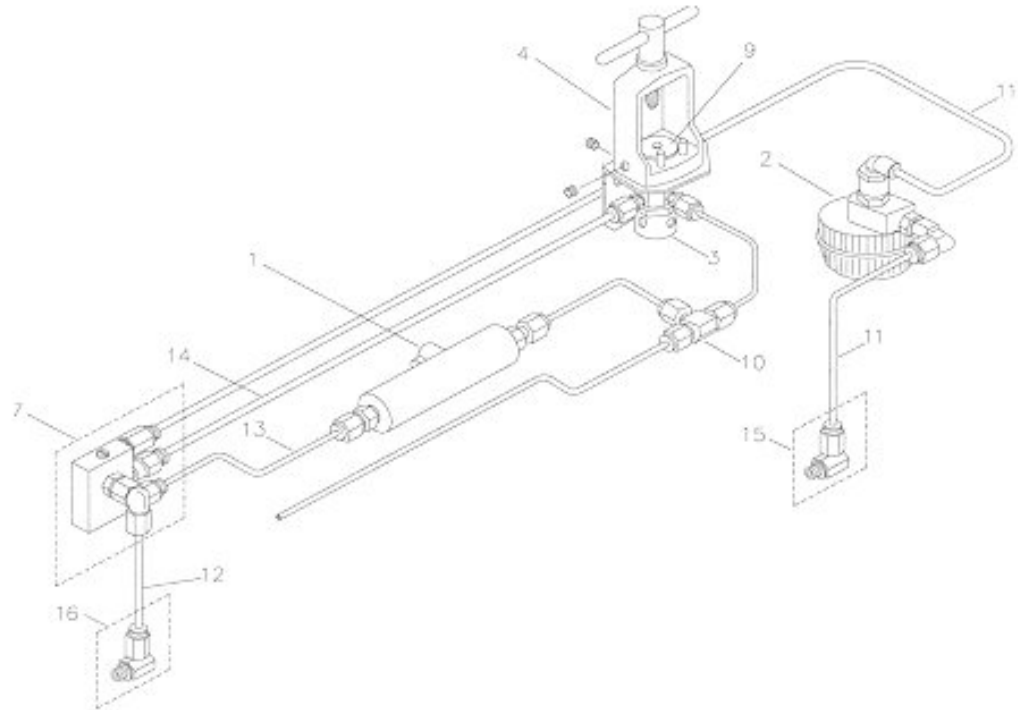
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Coolant Canister Hold-down Strap	8	Harness Retainer Pin Cap
2	Oxygen Cylinder Hold-down Strap	9	Breathing Chamber Mounting Block
5	Diaphragm Spring	14	Lower Housing with Hardware
7	Long Harness Retaining Pin	15	Carrying Handle Strap

## Upper Housing Assembling



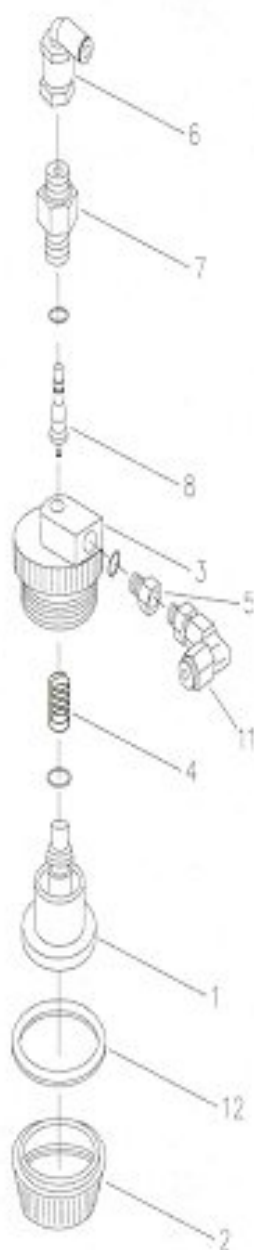
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Warning Label	4	Pan Head Screw
2	USA Label	5	Flexible T-Handle Draw Latch
3	Upper Housing with Hardware	6	Hex Nut

## Pneumatic Assembly



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Alarm Whistle Assembly	11	1/8" Nylon Tubing
2	By-pass Valve Assembly	12	5/32" Nylon Tubing
3	Oxygen Cylinder Pressure Reg. w/ fittings	13	1/8" Copper Tubing
4	Oxygen Cylinder Yoke w/ Handle	14	3/16" Copper Tubing
7	Manifold Block Assembly	15	Tube Quick Disconnect Fitting (Red)
9	Oxygen Cylinder Sealing Washer	16	Tube Quick Disconnect Fitting (Brass)
10	High Pressure Tube Assembly		

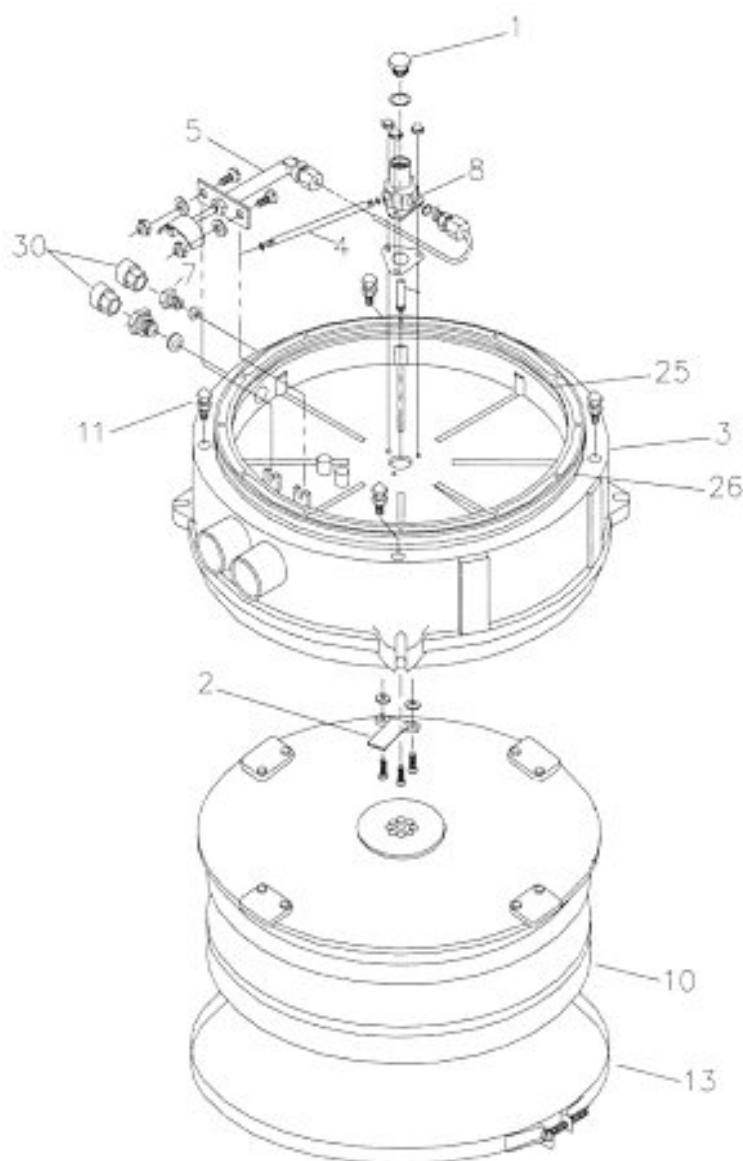
## By-Pass Valve Assembly



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Push Button	6	Female Elbow Fitting
2	Valve Guard	7	Valve Holder
3	Valve Body	8	Valve Core
4	Valve Spring	11	Male Swivel Elbow Fitting
5	Bushing	12	Bypass Valve Mounting Washer

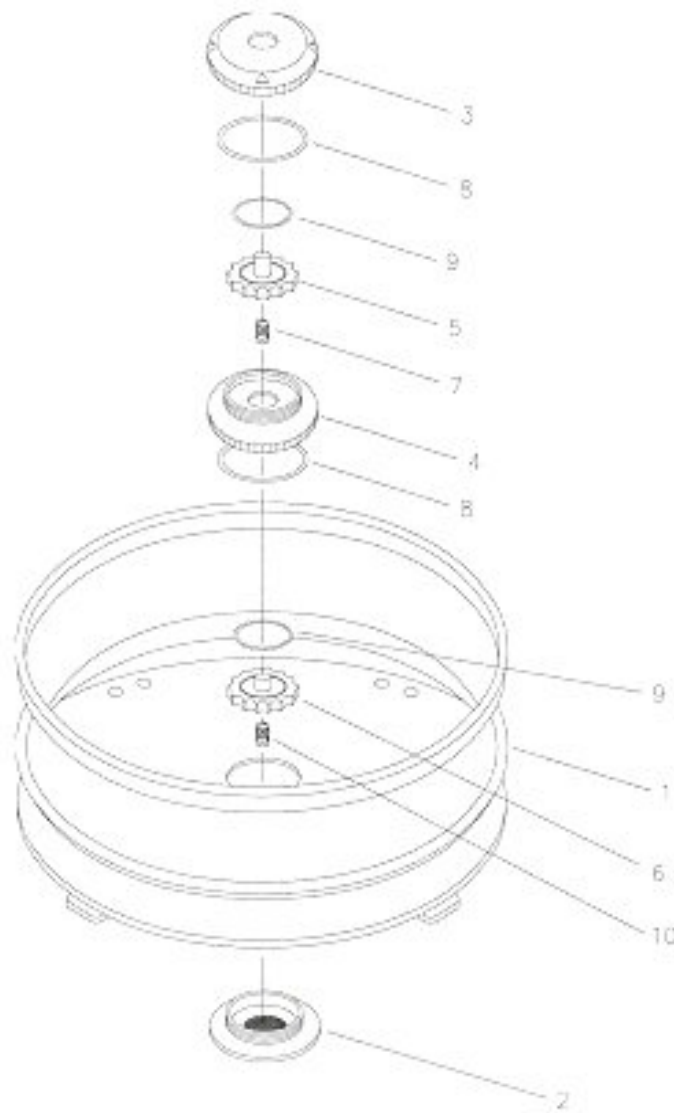


## Breathing Chamber Assembly



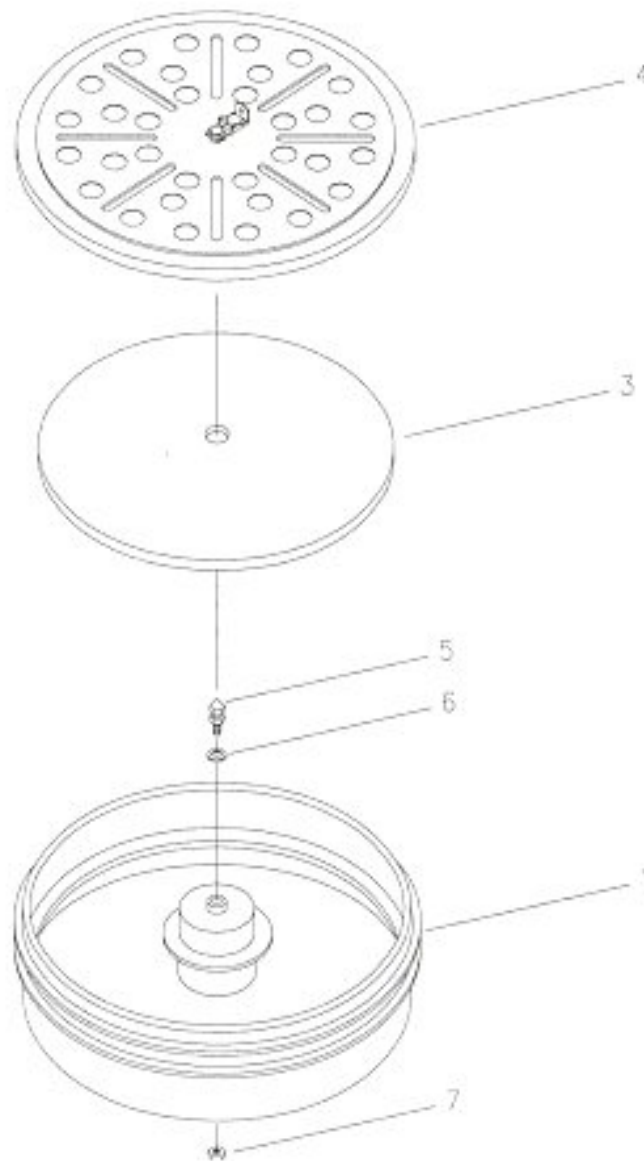
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Constant Add Restrictor Fitting	10	Diaphragm Assembly
2	Add Valve Lever	11	Latch Stud
3	Center Section Housing	13	Diaphragm Worm Gear Clamp
4	Supply Connector Tube	25	O-Ring Seal
5	Anti-Anoxia Valve Assembly	26	O-Ring Seal
8	Demand Housing	30	Quick Connect Coupler Fitting

## Diaphragm Assembly



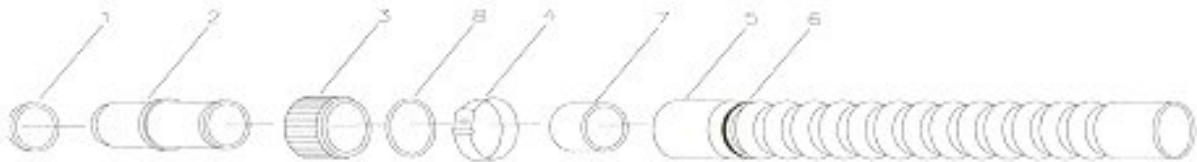
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Diaphragm with Hardware	6	Vent Valve Secondary Seat
2	Vent Valve Cap w/ Screen	7	Vent Valve Spring (Silver)
3	Vent Valve Primary Body	8	O-Ring Seal
4	Vent Valve Secondary Body	9	O-Ring Seal
5	Vent Valve Primary Seat	10	Vent Valve Spring (Red)

## Carbon Dioxide Scrubber Assembly



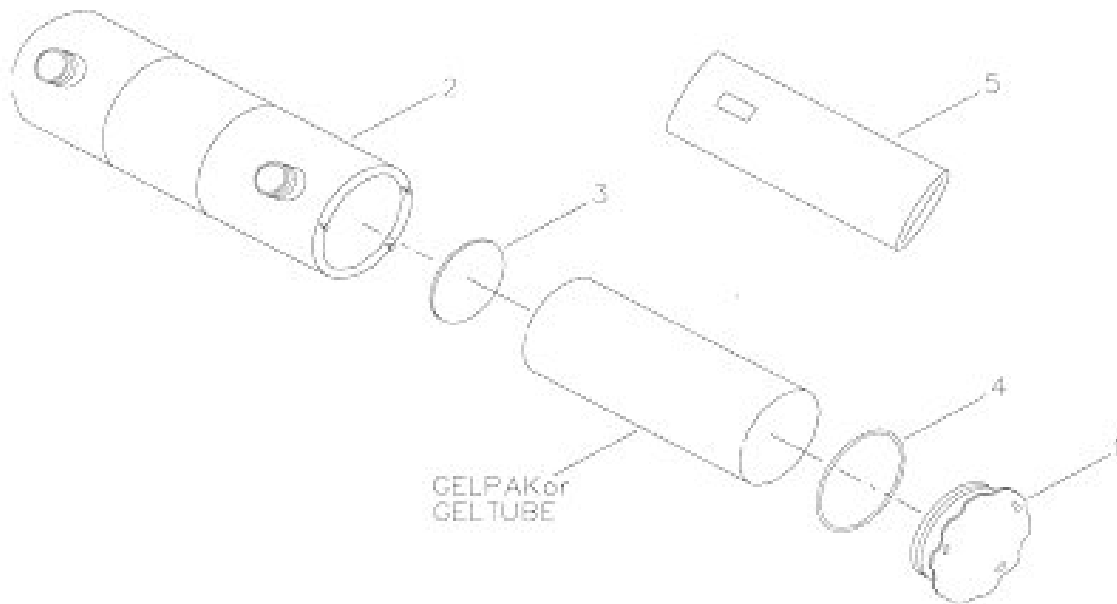
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Scrubber Housing	5	Latch Stud
3	Foam Pad	6	Flat Washer
4	Cover	7	Hex Nut

# Hose Assembly



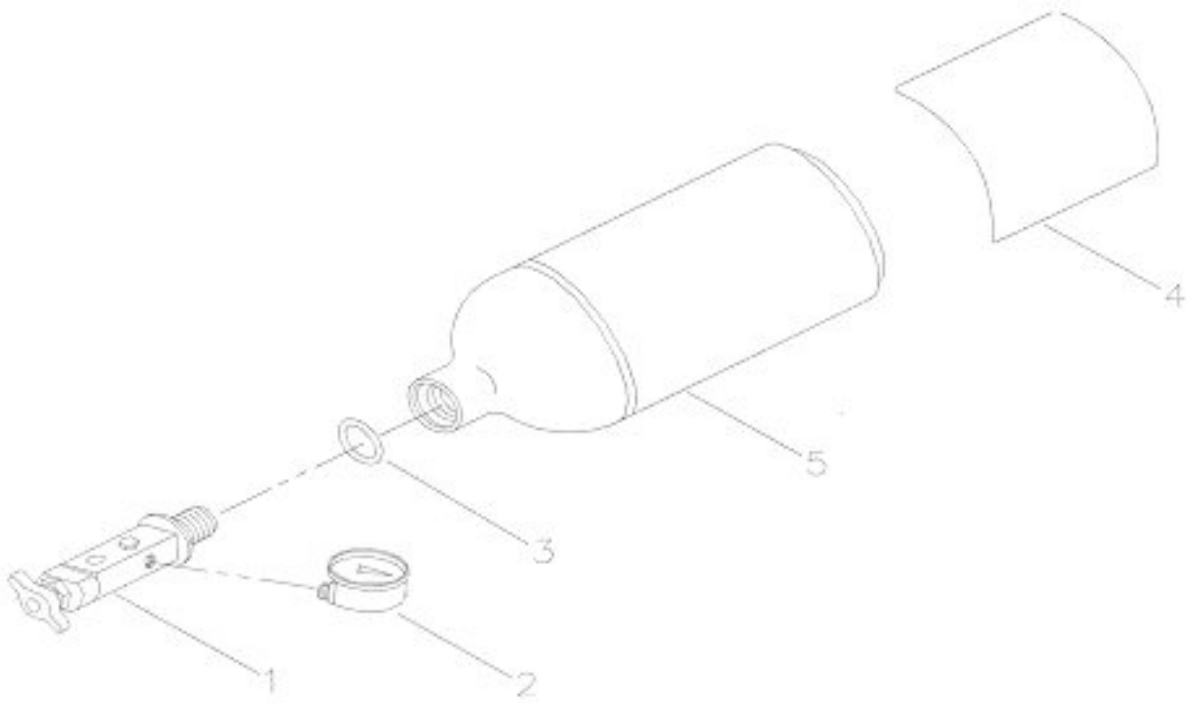
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Hose Connector Gasket	5	Breathing Hose
2	Hose Connector Body	6	Nylon Cable Tie
3	Hose Connector Nut	7	Hose Connection Cuff
4	Hose Clamp	8	Inhalation Hose ID Label

## Coolant Canister Assembly



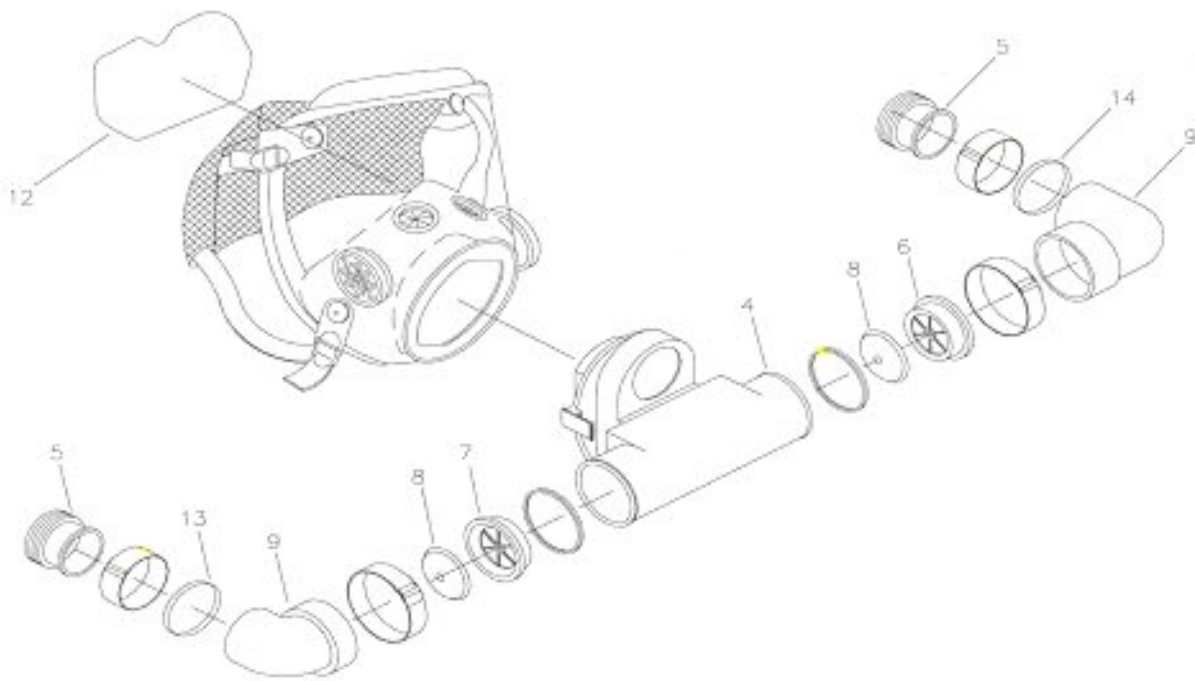
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Canister End Cap	4	O-Ring Seal
2	Canister Body	5	GelPak Freeze Form
3	Foam Moisture Absorbent Pad		

## Oxygen Cylinder Assembly



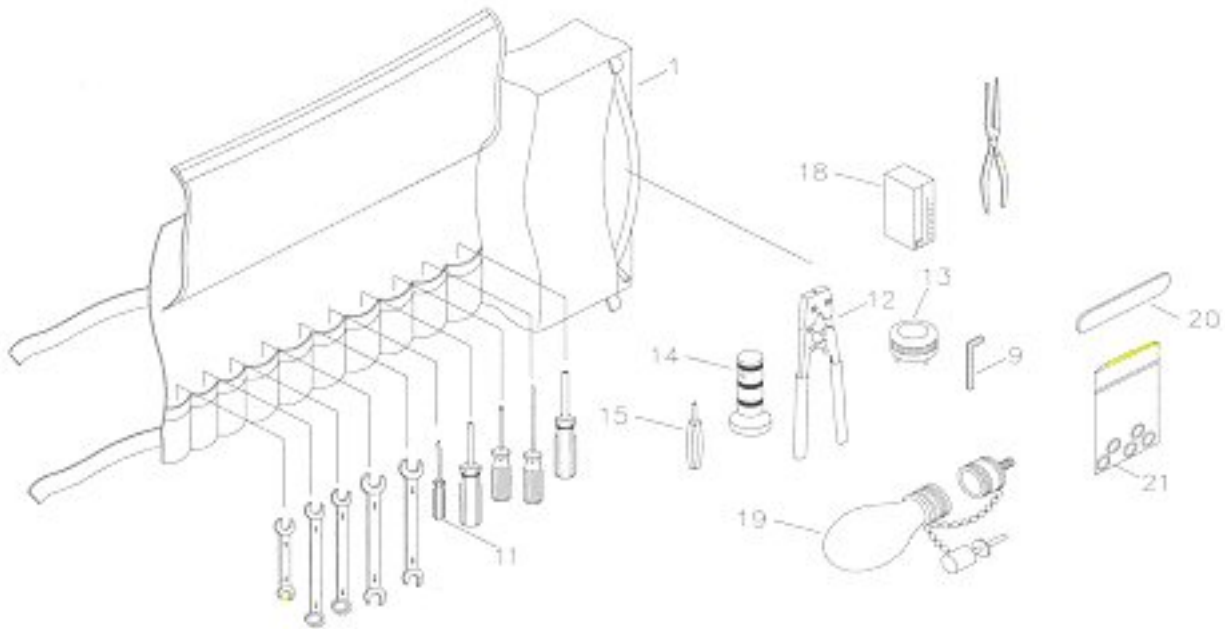
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Oxygen Cylinder Valve	4	Identification Label
2	Pressure Gauge	5	Composite Pressure Cylinder
3	O-Ring Seal		

## Face Piece Assembly



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
4	Adapter Assembly	9	Elbow Connector
5	Hose Adapter Fitting	12	Anti-fog Lense Insert
6	Inhalation Check Valve Holder	13	Nylon Red Cable Tie
7	Exhalation Check Valve Holder	14	Nylon Green Cable Tie
8	Check Valve		

## Tool Kit Assembly



1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Tool Kit Pouch	15	Valve Core Tool
9	1/16" Allen Key Wrench	18	Flow Test Flowmeter
11	Combination Pick Tool	19	Balloon Leak Test Fixture/Test Key
12	Hose Clamp Ratchet Pincher Tool	20	6" Tongue Depressor
13	Bypass Valve Wrench	21	Small Finger Cot



***SECTION VI***

***PRESHIFT***

**2005 PRESIFT CONTEST RULES**

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Section VI

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## **RULES GOVERNING 2005 PRESIFT CONTEST AND INTERPRETATIONS OF DISCOUNT CARDS**

1. Contestant must be a bonafide employee of a mining company or contractor and be certified as a mine foreman or examiner in the state in which the contestant is employed. Proof of certification must be presented at time of registration. Card, certificate, etc. will be accepted. If such proof is not provided prior to the contest, the participant will not be allowed to compete.
2. Judges will be employees of the Mine Safety and Health Administration (MSHA) and other assisting State Agencies.
3. Contestant must bring safety cap, safety shoes, mining belt with identification tag, check-in tag, MSHA approved cap light, SCSR, anemometer, watch (with second hand or equivalent), an MSHA approved device to detect explosive and dangerous gases and/or deficiencies of oxygen, and a device for testing the roof. If a contestant cannot provide an SCSR due to air travel restrictions, you should notify the registrar upon sending the registration form and an SCSR will be provided. All other materials needed to work the problem will be furnished, such as distance/area measuring devices, tool aprons, and materials for placing dates, times and initials, writing instruments, paper, and a clipboard for recording their work. Contestant may bring personal items to the field provided the items do not contain prohibited information. Prohibited information means, but is not limited to, rules, maps, mine plans, calculating charts (i.e. ventilation formulas), personal ("reminder") notes.
4. A contest point system has been established. Failure to find/correct deficiencies or hazards, if necessary, failure of the contestant to verbally identify work, tests, or action being taken to the judge(s), or failure to report on the record page will be assessed discounts. The accumulation of discounts will establish the contestants ranking in the contest. Three scoring segments will be used during the contest: written examination, underground, and the preshift record page.
5. Upon completion of the problem, the contestant will be given an opportunity to review the discounts and have the right to appeal in writing to the Chief Judge. Twenty minutes will be allowed for review and preparation of written protests. The Chief Judge will have final decision on all appeals.

6. All contestants will take a written examination. The examination will consist of 10 fill-in-the-blank questions, taken from the published statements of fact. Contestants will have 10 minutes to complete the written examination. Two points will be discounted for each incorrect answer.
7. A fireboss station will be provided. Two stopwatches, or one clock and a stopwatch will be at the station. The contestant will start one, and a stopwatch will be started and carried by a Judge. When the contestant arrives at the field a blank map and a written statement will be provided. The contestant will have five minutes to review the statement prior to starting the clock and the underground portion of the contest.
8. A maximum working time of 30 minutes will be in effect for the underground portion of the contest. The contestant will be notified when there is one minute left to complete the problem.
9. The portion of the mine to be examined will be addressed in a briefing prior to working the problem.
10. If during the problem, date, time and initials need to be posted, the information shall be written on an index card and the card placed on the mine floor at the required location. The contestant's personal watch time will be the time used on the card.
11. The contestant's personal watch time will be the time used on the preshift record for time of examination.
12. A placard placed on the mine floor will indicate all equipment, conditions, or potential underground hazards. The lettering on the placards will be at least one-inch in height. Contestants will not remove any items or placards unless specifically addressed in the problem.
13. During the working of the problem, contestants shall correct conditions or hazards, where means or materials have been provided. Where conditions can be corrected by physically moving an item or ventilation device, such action need not be indicated on an index card. Where conditions are not corrected, danger signs or other types of indicators will be shown on index cards and placed on the mine floor.

14. The contestant will be provided linear feet, width and height, or area dimensions (whole numbers only), where air measurements are required during the working of the problem. Air measurements will be simulated, using the traverse method, for a minimum of 60-seconds. Calculators or similar devices will be allowed.
15. Once the underground segment is completed, the contestant shall exit the mine, check out, stop the clock, and will be escorted to the assigned area to fill out a preshift record page. Contestant will not be allowed to re-enter the mine. Contestant will have 15-minutes to complete the preshift record. Upon completion of the record, the contestant will turn-in the preshift record page, all index cards, and the section working map. Discounts will be assessed for each item not recorded within the allotted time.
16. In the event an unforeseen problem arises, the time clock will be stopped, and the contestant will be removed from the field and taken to a neutral area. Following correction, the contestant will be returned to the field to complete the problem, and the time clock will be restarted. The field judges, prior to the completion of the problem, will adjust any discrepancies in the working time. At the completion of the problem the contestant will be notified of any corrective actions concerning the working time.
17. In the event the contestant uses all provided cards, or the contestant's marker fails, the contestant should immediately notify the judges. Items provided for that purpose will be given to the contestant.
18. No unauthorized person(s) will be allowed in the isolation area, or on the contest field, without permission from the Chief Judge.
19. Discounts will be assessed if the preshift record page is not legible to the judges.
20. In the event of a tie, underground discounts will be the first tie breaker, preshift record will be the second, written examination will be the third, and the elapsed working time will be the fourth tie breaker.
21. All discounts assessed to the contestant will be concurred by the two Field Judges.
22. Judges should not talk with contestants during the working of the problem, other than to convey required information.

23. Immediately after briefing, no communication between contestant and any outside party will be allowed. Contestants receiving contest information after entering the isolation area will be disqualified.
24. Contestant may take reference material into the isolation area. The contestant may not use any of this reference material when working the problem or taking a written exam. Contestants will not carry personal notebooks into the contest area.
25. All gas detecting instruments used or taken into the mine must be tested in the presence of the judges at the fireboss station after starting the clock. (Gas detecting instruments will be left on during the working of the problem.) If an instrument fails during testing, and the contestant takes corrective action with a backup instrument that has been tested in the presence of the judges, no discount will be assessed.
26. Persons wishing to photograph or video tape the contest must receive permission from the Chief Judge.

## INTERPRETATION OF THE FIELD SCORECARD

1. Failure to check in after starting the clock and check out prior to stopping the clock \_\_\_\_2

Contestant must start the time clock before commencing any work other than reviewing the materials provided by the judges.

2. Failure to have required equipment \_\_\_\_2

Required equipment is safety cap, safety shoes, mining belt, cap light, SCSR, anemometer, watch (with second hand or equivalent) and a MSHA approved device to detect explosive and dangerous gases and/or deficiencies of oxygen, and a device for testing the roof. Contestant should have required equipment prior to leaving isolation area. A discount will be assessed for each omitted item.

3. Failure to visually examine self-contained self-rescuer prior to entering the mine \_\_\_\_2

4. Failure to place date, time, and initials at required locations \_\_\_\_2 (each location)

Date, time and initials are to be placed where methane tests are required.

Date means correct month, day, and year.

5. Failure to make necessary gas tests where required, each omission \_\_\_\_3 each gas (maximum 6 each location)

Methane and oxygen deficiency tests shall be taken:

- A. In all roadways, travelways, and track haulageways where persons are required to work or travel.
- B. In all working places on the section and at areas where mechanized mining equipment is being installed or removed.
- C. In areas where persons are scheduled to work, prior to the preshift examination.

- D. At faces or last row of permanent roof support in rooms driven over 20-feet off intake aircourses.
  - E. At seals along intake aircourses.
  - F. At underground electrical installations, except; small hand held portable pumps, permissible pumps and associated permissible switchgear, and submersible pumps.
  - G. Immediately inby approaches to worked-out areas along intake aircourses, and at high spots where methane is likely to accumulate, and equipment will be operated in the area during the shift.
  - H. In all accessible face areas, at the face or last row of permanent roof support.
6. Improper procedure when testing with gas detectors, testers, and indicators \_\_\_\_2 (Possible 4 discounts at each location)

A proper test for methane and oxygen deficiency shall require the following action by the examiner:

METHANE - Detector shall be held at eye level or higher

OXYGEN DEFICIENCY - Detector shall be held at waist level or below

The contestant will verbally identify each test to the judge(s).

7. Failure to determine correct section ventilation and proper direction of the ventilating current \_\_\_\_10 (Each Location)
- Failure to determine by air measurement, the direction and volume of the ventilating air current. Failure to determine correct direction of air current at regulators. Less than 9,000 cubic feet per minute (cfm) measured in the last open crosscut will be considered a hazard, unless otherwise stated in the written problem or other written instructions. Failure to assure section ventilation is maintained as required by the approved ventilation plan.
8. Improper procedure when taking an air measurement \_\_\_\_2 (Each Occurrence)

Failure to traverse the entry/crosscut perpendicular to the ventilating current.  
Failure to measure the air current for 60-seconds.



9. Improper procedure when examining and testing the mine roof \_\_\_\_2

Failure to visually examine the mine roof. The examiner shall verbally state his/her visual examination of the mine roof at least one time in each entry. A discount will be assessed where the contestant fails to conduct a visual examination in areas not requiring a sound and vibration test. Roof tests are required where roof supports are to be installed. Prior to setting roof supports, a sound and vibration test is to be made when visual examination does not disclose a hazardous condition.

10. Failure to find hazardous condition \_\_\_\_10

Discount will be assessed if contestant fails to verbally identify hazardous conditions intended to be part of the problem.

11. Failure to take corrective action when finding a hazardous condition \_\_\_\_10  
each omission

Hazardous conditions must be corrected by the contestant during the examination when means or materials are available. If means or materials are not available, endangering off a hazardous condition will be considered acceptable corrective action.

12. Traveling at more than walking speed \_\_\_\_5

Concurrence by two (2) judges required.

13. Contestants equipment not maintained in operable condition, each infraction  
\_\_\_\_2

Would include cap lamp, methane detector/oxygen indicator, anemometer and SCSR. Discount will be assessed if gas detection instrument fails during the working of the problem and no other instrument is provided. Concurrence by two (2) judges required.

14. Any act by the examiner, which may result in an explosion of an explosive  
air/gas mixture \_\_\_\_30

A. Changing conditions of the section ventilation in such a manner that an explosive mixture is moved over an ignition source.

- B. Encountering an explosive air/gas mixture in a face, or other area, and failing to take proper corrective actions.

An explosive mixture will be present when the methane is between five and fifteen percent inclusively and the oxygen is 12.1 percent or greater. Both methane and oxygen concentrations will be shown on the placards.

15. Any act by the examiner, which may endanger himself/herself or others\_\_ 20
- A. Entering or remaining in an area known to contain an irrespirable atmosphere. Atmospheres containing less than 19.5 percent oxygen are irrespirable. Concentrations must be shown on the placard.
- B. Encountering an adverse roof condition and failing to take adequate protective actions. Protective actions would be posting a readily visible warning or a physical barrier.
- C. Traveling under unsupported or unsafe roof. (Self explanatory)
- D. Traveling through water over knee deep. (For contest only)
16. Contestant not following the written instructions for working the problem  
\_\_\_ 15
17. Failure to examine all accessible areas, each location \_\_\_\_\_5 (Maximum 20 points)
18. Failure to comply with general rules not covered in the discount sheet\_\_\_\_2

## INTERPRETATION OF THE PRESIFT RECORD

1. Preshift record page not legible \_\_\_\_2

Discount assessed to each illegible article; two judges must concur, not to exceed 30.

2. Failure to record location of examination \_\_\_\_2

Each omission.

3. Failure to record hazardous conditions \_\_\_\_2

Each omission.

4. Failure to record action taken to correct hazardous conditions \_\_\_\_2

Applies only to a condition(s) that could be corrected by the contestant during the examination where a means or materials were available, each omission.

5. Failure to record date and time of examination \_\_\_\_1

6. Failure to record results of air measurements \_\_\_\_1

7. Failure to record results of methane (CH<sub>4</sub>) examinations \_\_\_\_1

Each omission

8. Failure to certify by signature \_\_\_\_1

9. Failure to date entry of signature \_\_\_\_1

**STATEMENTS OF FACT  
PRESHIFT CONTEST**

1. A preshift examiner must be certified or registered in the State in which the coal mine is located. (Mine Act 1977, Sect. 318(a))
2. Preshift examinations must be conducted within three hours preceding the beginning of any 8-hour interval during which any person is scheduled to work or travel underground. (30 CFR 75.360(a)(2))
3. The lower explosive limit for methane is five volume percent. (MSHA 2102, p. 31)
4. Air being used to ventilate areas where persons work or travel shall contain at least 19.5 percent oxygen. (30 CFR 75.321(a)(1))
5. Ventilation is utilized to dilute, render harmless, and carry away flammable, explosive, noxious, and harmful gases, dusts, smoke, and fumes. (30 CFR 75.325, 330(b)(1))
6. When taking a reading with an anemometer, a commonly used method is to traverse the airway. (MSHA 2103, p. 29)
7. Low barometric pressures may cause methane to migrate outward from pillared areas into active workings.
8. About 21 percent of normal air is oxygen. (MSHA 2102, p. 27)
9. Where the mining height permits and the visual examination does not disclose a hazardous condition, sound and vibration tests, or other equivalent tests, shall be made where supports are to be installed. (30 CFR 75.211(b))
10. Methane is lighter than air. (MSHA 2102, pp. 13, 31, & 67)
11. To test for methane, use a methane detector or chemical analysis. (MSHA 2102, p. 33)
12. High voltage cables and transformers shall not be located in by the last open crosscut and shall be kept at least 150 feet from pillar workings. (30 CFR 75.1002)
13. The upper explosive limit for methane is 15 volume percent. (MSHA 2102, p. 31)

14. Methane detectors should be calibrated with a known methane-air mixture at least once every 31 days. (30 CFR 75.320 (a))
15. Each underground coal mine operator shall ensure that at least two miners in each working section on each production shift are proficient in the use of all fire suppression equipment available on such working section, and know the location of such fire suppression equipment. (30 CFR 75.1101-23(b)(1))
16. Carbon monoxide has no taste or odor. (MSHA 2102 p.87)
17. Tests for methane concentration should be made at least 12 inches from the roof, face, ribs, and floor. (30 CFR 75.323(a))
18. The end of permanent roof support shall be posted with a readily visible warning, or a physical barrier shall be installed to impede travel beyond permanent support. (30 CFR 75.208)
19. Roof support materials, sequence of roof support installation and spacing, are stated in the Approved Roof Control Plan. (30 CFR 75.221)
20. All electric face equipment taken into or used in by the last open crosscut shall be permissible. (30 CFR 75.503)
21. Escapeways shall be clearly marked to show the route and direction of travel to the surface. (30 CFR 75.380(d)(2))
22. No person other than certified examiners may enter or remain in any underground area unless a preshift examination has been completed for the established 8-hour interval. (30 CFR 75.360(a)(2))
23. Ventilation controls are used underground to properly distribute air to all sections of the mine. (MSHA 2103, p. 11)
24. Tests for oxygen deficiency shall be made by a qualified person with MSHA approved oxygen detectors maintained in permissible and proper operating condition. (30 CFR 75.320(b))
25. Carbon monoxide can be detected by means of carbon monoxide detectors, multi-gas detectors, or chemical analysis. (MSHA 2102, p. 36)
26. The minimum open crosscut air requirements also applies to sections which are not operating but are capable of producing coal by simply energizing the equipment on the section. (30 CFR 75.325(b))

27. Lubricating oil and grease kept underground shall be stored in fireproof, closed metal containers. (30 CFR 75.1104)
28. The results of the preshift examination must be recorded in a book, provided for that purpose on the surface, before any persons other than the examiners may enter any underground areas. (30 CFR 75.360)
29. All fire suppression devices shall be visually inspected at least once each week by a person qualified to make such inspections. (30 CFR 75.1107-16(a))
30. Preshift examinations are made by persons designated by the operator. (30 CFR 75.360(a)(1))
31. A bar for taking down loose material shall be available in the working place or on all face equipment except haulage equipment. (30 CFR 75.211(d))
32. The operator must establish 8-hour intervals of time subject to the required preshift examinations. (30 CFR 75.360(a)(2))
33. In exhausting face ventilation systems, a mean entry velocity of at least 60 feet per minute will reach each working face where coal is being cut mined or loaded. (30 CFR 75.326)
34. Test holes, spaced at intervals specified in the roof control plan, shall be drilled to a depth at least 12 inches above the anchorage horizon of mechanically anchored tensioned roof bolts being used. (30 CFR 75.204(f)(2))
35. Before implementing an approved revision to a roof control plan, all persons who are affected by the revision shall be instructed in its provisions. (30 CFR 75.220(d))
36. A minimum quantity of 3,000 cubic feet per minute shall reach each working face where coal is being cut, mined, drilled for blasting, or loaded. (30 CFR 75.325)
37. Self-contained self-rescuers are used to protect the wearer from the effects of irrespirable atmosphere.
38. The quantity of air reaching the last open crosscut of each set of entries or rooms on each working section and the quantity of air reaching the intake end of a pillar line shall be at least 9,000 cubic feet per minute unless a greater quantity is required to be specified in the approved ventilation plan. (30 CFR 75.325(b))

39. Rock dust applications to the roof, ribs, and floor shall be maintained to within 40 feet of the working face, except in those areas where the dust is too wet or too high in incombustible content. (30 CFR 75.402)
40. The results of preshift examinations may be called out to a responsible person on the surface, or carried to the surface by the examiner. (30 CFR 75.360)
41. Oxygen detectors shall be calibrated at the start of each shift that the detectors will be used. (30 CFR 75.320(b))
42. Chemical extinguishers shall be examined every six months and the date of the examination shall be written on a permanent tag attached to the extinguisher. (30 CFR 75.1100-3)
43. Conveyor belts used to transport persons during the oncoming shift must be examined during the preshift examination. (30 CFR 75.360)
44. High spots where methane is likely to accumulate, over haulageways where equipment will travel must be examined during the preshift examination. (30 CFR 75.360)
45. Any area of the mine where a hazardous condition is observed shall be posted with a conspicuous danger sign where anyone entering the area would pass. (30 CFR 75.360(e))
46. Methane tests and the examiner's certification with date, time and initials, shall be made at seals located along intake aircourses. (30 CFR 75.360)
47. A visual examination of the roof, face and ribs shall be made immediately before any work is started in an area and thereafter as conditions warrant. (30 CFR 75.211(a))
48. Low barometric pressures may cause seals to leak the sealed atmosphere outward into adjacent airways. (Miner's Circular 36, Bureau of Mines, 1948)
49. Regulators are used in mine ventilation to regulate airflow to meet the individual needs of each air split. (MSHA 2103, p. 20)
50. A sightline or other method of directional control shall be used to maintain the projected direction of mining in entries, rooms, crosscuts and pillar splits. (30 CFR 75.203(b))